



RESILIENT ASSETS AND SUSTAINABLE OUTCOMES

2019 Sustainable Electricity Annual Report



Canadian
Electricity
Association

Association
canadienne
de l'électricité



Sustainable
Electricity
It's in our power™

Électricité
durable
Nous avons le pouvoir™





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Sustainable Electricity™ is a mandatory
sustainability program developed and
implemented by the corporate utility
members of the Canadian Electricity
Association (CEA). The goals of the
program are to integrate sustainability
in company operations; foster
continuous performance improvement;
and advance the public acceptance and
support for utility operations through
meaningful engagement, collaboration,
transparency and accountability.

In that context, this report
provides an overview of the
sustainability performance of CEA
corporate utility members in 2018.
CEA would like to thank member
companies for reviewing the drafts.

CEA kindly asks that you read this
report electronically rather than from
a printed copy.

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ABOUT THIS REPORT

This report quantifies and discusses performance by Canadian Electricity Association (CEA) members – on a range of metrics organized under five reporting pillars – for calendar 2018 and at least three preceding years. It describes CEA's support for its members' pursuit of sustainability and includes case studies illustrating specific member efforts to advance towards this objective.

The five reporting pillars were adopted in 2016 following a CEA materiality assessment. The objective was to identify those aspects of the Canadian electricity industry's performance that are both most likely to significantly influence its future success, and of most interest to its stakeholders.

This exercise also involved a reconsideration of which specific metrics provide the best basis for assessing member performance in relation to each pillar, and in some cases a refinement of the specific nature and scope of the metrics.

Data in this report therefore typically extends back to 2015, although in some cases further, and the disclosure timeframe will continue to be extended in future reports. Refinement of data collection, verification and analysis is ongoing each year, and in some cases has led to a restatement of results previously reported for years prior to 2018.

Given the breadth and size of the CEA membership, the results reported are broadly reflective of national industry performance.

CEA has attempted to capture and communicate member performance in a balanced fashion, including commentary on performance trends and on the reporting framework from a multi-stakeholder Public Advisory Panel (see page 12). Reader feedback is welcome and can be provided to: info@electricity.ca

5 REPORTING PILLARS

1 - LOW-CARBON FUTURE

2 - INFRASTRUCTURE RENEWAL & MODERNIZATION

3 - BUILDING RELATIONSHIPS

4 - RISK-MANAGEMENT SYSTEMS

5 - BUSINESS EXCELLENCE



THE CANADIAN ELECTRICITY ASSOCIATION

Founded in 1891, the Canadian Electricity Association (CEA) is the national forum and voice of the evolving electricity business in Canada, contributing to the regional, national and international success of its members.

From vertically integrated electric utilities, independent power producers, transmission and distribution companies, to power marketers, to the manufacturers and suppliers of materials, technology and services that keep the industry running smoothly — all are represented by this national industry association.

CEA'S SUSTAINABLE ELECTRICITY PROGRAM

The preparation of this report – and the performance disclosures by individual companies that make it possible – is a key element of the CEA's Sustainable Electricity™ Program, which is mandatory for all member utilities. The program has its origins in the CEA's Environmental Commitment and Responsibility Program, established in 1997. The original program was ground-breaking in mandating member conformance to the ISO 14001 environmental management system and has evolved into a multi-faceted sectoral sustainability framework.

A CEA Sustainable Electricity Steering Committee oversees the program and the related performance disclosures. Increased assurance and comparability of carbon and infrastructure-investment data reported by members are among its current continuous-improvement focal points, and from time to time it sets specific performance objectives, which are referenced elsewhere in this report.

Both CEA and non-CEA member companies can apply for the separate CEA-administered Sustainable Electricity Company™ designation, which requires compliance with key international sustainability-related standards and third-party verification.

To date, seven CEA member companies have received the designation, including Nalcor Energy and Saint John Energy in 2018. A tool to support conduct of a gap analysis, relative to the designation requirements, was created in 2018. CEA has set an aspirational, non-binding goal for all non-designated CEA members complete such an analysis by the end of 2020.





CEA recognizes members for excellence in specific aspects of the pursuit of sustainability each year, along with an individual leadership award. [See who stood out in 2018.](#)



EXECUTIVE MESSAGE

On behalf of the members and directors of the Canadian Electricity Association, we are pleased to present our 2019 Sustainable Electricity Annual Report. It provides data and commentary on what we believe to be the most impactful and relevant aspects of sustainability within the Canadian electricity industry.

We're proud of our members' achievements and gratified by the recognition they periodically receive. As one commentator rightly put it, our national (electricity) grid is a green asset that most of the world can only look upon with envy. But we are also sobered by assessments of how much remains to be done across the Canadian economy, including the conclusion of the Office of the Parliamentary Budget Officer that – nationally speaking – we risk falling 79 megatonnes short of achieving [the carbon reduction Canada committed to at Paris](#).

CEA members continued to help drive Canada's transition to a lower carbon economy in 2018 and achieved an 11 per cent further reduction in their direct greenhouse gas emissions. They pursued tried-and-true tactics such as fuel substitution and renewables integration, while also advancing innovation. Examples included going beyond merely capturing carbon, to putting it to commercially viable and environmentally benign uses and assessing the potential for Canadian leadership in development of small modular nuclear reactors.

The push towards electrification, particularly in relation to personal use of electric vehicles, and to expansion and fuel conversion with respect to public transportation networks, continued to gain momentum as a decarbonization strategy. Along with broader decarbonization efforts, and climate adaptation and resiliency, this drove billions of dollars of industry infrastructure investment in 2018.

While significant, current investment levels almost certainly fall short of what's required to ensure our electricity grid becomes one of the key enablers of a dramatically lower-carbon Canadian economy. Among other activities in support of this objective, we advocated with government to avoid undue regulatory burdens and uncertainty, which risk restricting investment at the very time it needs to accelerate. We saw encouraging signs of some heightened government appreciation of this imperative.

CEA members continued to demonstrate a clear understanding that natural-resource and major-project development can only move forward in Canada today if they incorporate Indigenous reconciliation. And while the scope of the resulting relationships is not measured in dollars alone, the monetary value of formal CEA member-Indigenous relationships increased significantly in 2018.

Fundamental industrial risk factors in areas such as biodiversity, employee and public safety, and cyber security continued to be rigorously managed. And consumer-facing members kept pace with customer expectations for even easier access to services and touchpoints. Interesting interplays among key issues continued to emerge, such as expanded cyber security vulnerabilities associated with automation and digitization initiatives.

Challenges of course remain, and key ones are noted in this report (see "Opportunities for Improvement"). But industry efforts in 2018 did successfully drive towards the objectives of strengthening industry assets in their ability to withstand and recover from challenging circumstances – increasingly frequent extreme weather being one example – while at the same time delivering the sustainable outcomes we are committed to across key environmental, economic and social metrics.



Mr. Max Cananzi
President, Alectra Utilities
Chair, CEA Board Committee
on Sustainability



Francis Bradley
President and Chief Executive,
Canadian Electricity Association

RESILIENCE AND TRANSFORMATION: THE CANADIAN ELECTRICITY INDUSTRY OUTLOOK

At the beginning of 2019, CEA published an inaugural [state-of-the-industry report](#) and outlook, with highlights from each chapter on page 10. Both a sectoral vision and a guidepost for association activities to support its realization, the report assesses how greater resilience can be achieved with respect to six key industry issues. It underscores that business-as-usual is not an option when transformative change is underway.



| | |
|---|---|
| Competitiveness, Investment & Regulatory Environments | “Legislative and regulatory requirements should be outcome-driven, predictable and, to the greatest extent possible, non-duplicative. In the absence of that, the cumulative impact of a myriad of regulations has the ultimate effect of inhibiting new investments and increasing costs to electricity end-users.” |
| Infrastructure Renewal & Innovation | “Canadian utilities are investing in hundreds of other generation, transmission, and distribution infrastructure projects and other ancillary technologies... These investments will continue, but it is essential that governments and other stakeholders work with the industry to address some of the core challenges stifling infrastructure investment and innovation.” |
| Environmental Sustainability & Compliance | “[Federal] carbon pricing rules will have varying implications for utilities across the country based on their current electricity generation sources. Over the next few years, the industry will have to meet a myriad of other regulatory obligations on climate change, including coal and natural gas regulations, the clean fuel standard, and stringent carbon pricing requirements.” |
| Electrification of the Canadian Economy | “Shell Energy’s Sky Scenario predicts that by 2070 the rate of electrification of final energy in the world will more than triple, with global electricity generation reaching nearly five times today’s level. These changes will strain current infrastructure and delivery design to its maximum, making it crucial that electricity companies invest in new infrastructure.” |
| Cyber Security | “CEA members have been sharing innovative practices in recognition that we are only as strong as the weakest link, as well as advocating for improved partnerships with a range of stakeholders to improve the quality and timeliness of the threat information that the electricity industry requires to protect critical assets.” |
| The Canada-U.S. Electricity Relationship | “The cross-border electricity relationship has provided Canada and the U.S. with the reliable, resilient, affordable, clean and secure electricity that has helped power Canadian and American economies for over a century. However, the realities of the dynamic electricity environment today bring new challenges and opportunities that the cooperative nature of the Canada-U.S. electricity industry is well suited to meeting.” |



PUBLIC ADVISORY PANEL LETTER

October 26, 2019

Mr. Max Cananzi
President, Alectra Utilities
Chair, CEA Board Committee on Sustainability

Re: Public Advisory Panel's Annual Letter

The members of the Sustainable Electricity Program's Public Advisory Panel are pleased to submit the 2019 Annual Letter of Advice to the Canadian Electricity Association (CEA) Board Committee on Sustainability and the Board of Directors regarding your members' sustainability performance during the 2018 reporting year.

The Public Advisory Panel congratulates member companies on good performance achieved in the 2018 year. We note that organizations have continued to consider our concerns about data quality raised in 2017, providing much improved data that most member companies are embracing. This has resulted in continuous, albeit incremental, improvement with respect to many of the indicators being reporting upon.

Greenhouse Gas Emissions

Although electricity generation remained relatively flat in 2018, Greenhouse Gas (GHG) emissions continued to trend downward. We are aware of additional changes to the sector's fossil fuel fleet that are likely to decrease emissions even further in advance of expected retirement of traditional coal facilities by 2030, which is positive news. We look forward to seeing a further reduction in GHG emissions in the years ahead.

Environment, Health and Safety

The number of priority spills tracked and lost time accidents and injuries also remain at relatively low levels. We would like to see these continue to trend downwards. Our view is that the member companies should continue to put a high priority on environment, health and safety, producing consistent results.

Diversity & Inclusion

We see that there continues to be progress on the advancement of women into key positions and engagement with Indigenous Peoples and communities. In order to make more progress on diversity and inclusion, we strongly recommend that the member companies assess and develop a comprehensive strategy for the hiring, retention and promotion of women, Indigenous Peoples, and people of color, among other groups.

In addition, it is important for companies to proactively engage young Canadians, so they can learn about the industry and potential career paths. We recommend that member companies look to Hydro One for an excellent approach to this issue. We note that CEA has signed onto EqualBy30 and we look forward to further progress on gender diversity at the CEA Board, executive and management levels.

Indigenous Reconciliation

We also repeat our recommendation from last year that with Canada's adoption of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and the movement toward reconciliation, CEA member companies should initiate plans to advance reconciliation with Indigenous peoples in Canada in their work and operations if they have not done so already. These plans can build upon CEA's National Principles for Engagement of Indigenous Peoples, although the plans should be specific to the members' local context and operations. CEA and its member companies should continue to expand and improve upon the performance metrics currently in use under the sustainability program and be open and transparent about progress against those metrics.

Technology Advancement and Workforce

Rapid changes are occurring in all segments of society, and in this sector in particular, associated with the transition to a low-carbon economy, emergence of Artificial Intelligence (AI), and a number of other disruptive technologies. These changes present challenges, which must be proactively addressed. They will redefine capital investment needs but, most importantly, they will disrupt your workforce by simultaneously displacing existing employee roles and creating the need for new specialized talent. The human resources implications of this must be considered and dealt with through the development of transition plans and potential retraining of displaced workers. Although the resulting restructuring will provide opportunities for improving diversity and opportunities for the recruitment of youth, we note that the turmoil associated with these changes may test and/or stress your current progress on diversity and sustainability.

Biodiversity Loss

As you know, declining biodiversity has reached crisis proportions with numerous reports released in 2018 and 2019 pointing to massive die offs and extinctions of species expected in the next decade and beyond. Member companies have made some progress but much more needs to be done at a time when biodiversity is under extreme pressure from a combination of habitat loss, extreme weather events and climate change more generally. Many member companies have large land holdings and therefore have an excellent opportunity to make a positive contribution to Canada's biodiversity.

CEA and members should earnestly work on a comprehensive framework or guidance document for the industry to further protect and enhance biodiversity. CEA and members could take the Beneficial Management Practices (BMP) guide recently developed for the conservation of migratory birds and expand it to other biodiversity issues.

Climate Adaptation & Resiliency

Adverse weather events are becoming increasingly severe, including heat waves, droughts, floods and fires. In fact, a major utility went bankrupt in California because of forest fires and has been implicated as potentially responsible. CEA members should establish real and credible objectives and/or targets to adapt and be more resilient in the face of these changes. The CEA Board Committee on Sustainability has already established an aspirational objective to have CEA companies develop adaptation plans by end of 2020. We emphasize the importance of taking this commitment seriously and making progress on this objective, although it is not mandatory for CEA members. Further, in the spirit of continuous improvement, it may be necessary to consider worker health and safety in light of changing weather such as additional breaks, training, overtime and other consequences of extreme weather events.

Electrification of Transportation, Buildings & Industry

Given the relatively low GHG emissions from the electricity sector, it has a significant opportunity to help decarbonize other sectors, including transportation, buildings, and industry.

CEA should develop bold goals for the sector, particularly for electrified transportation that would support the federal government's stated target that all new car sales will be zero-emission vehicles (ZEV) by 2040 (with interim sales goals of 10% by 2025 and 30% by 2030). Canada's electricity sector must be part of the national electrification discussion and must be prepared to meet the increasing demand for electricity without increasing GHG emissions. CEA might consider setting its own target, endorsing the federal government's target, or otherwise taking a formal position so it is clear where the sector stands.

Information Sharing and Collaboration

Last year, we requested to have the opportunity to draw on the expertise of some of the staff of member companies to help us with our deliberations. We had that opportunity at our spring 2019 meeting and found it to be enlightening and useful in the development of this year's letter. This is a practice we would recommend be normalized for the operation of the Panel going forward.

Conclusion

The Public Advisory Panel was once again impressed with both the responsiveness of CEA to our suggestions from last year and the progress that has been made to date. More, however, should be done and we trust you will find this year's comments instructive as you continue on your journey of continuous improvement in the future.

Sincerely,



Gord Miller
Chair, Public Advisory Panel

PERFORMANCE AT A GLANCE

ELECTRICITY GENERATED

| Net Generation by Fuel Type (gigawatt-hours) | 2016 | 2017 | 2018 | Annual Change |
|--|----------------|----------------|----------------|---------------|
| Coal | 62,489 | 61,356 | 51,543 | -16% |
| Diesel | 659 | 526 | 544 | +3% |
| Natural Gas | 29,838 | 30,716 | 37,935 | +24% |
| Oil | 2,370 | 2,070 | 1,662 | -20% |
| Total Fossil | 95,355 | 94,668 | 91,685 | -3% |
| Hydroelectric | 297,244 | 303,459 | 295,014 | -3% |
| Nuclear | 72,316 | 70,175 | 69,257 | -1% |
| Renewables (biomass, wind, solar, tidal, biofuel, other) | 9,004 | 8,245 | 7,442 | -9% |
| Total Non-Fossil | 378,564 | 381,879 | 371,712 | -3% |
| TOTAL Net Generation | 473,919 | 476,547 | 463,397 | -3% |

The figures above are absolute measures (in contrast to intensity measures, expressed on a per-unit-of-production basis). They can therefore be impacted by CEA membership changes from one year to another, as well as by acquisitions or divestments on the part of members.



LOW-CARBON FUTURE

| | 2016 | 2017 | 2018 | Annual Change | |
|--|-----------|-----------|-----------|---------------|---|
| CEA Member Carbon Emissions – Absolute (total carbon equivalent emissions from operations, Mt) | 77.3 | 75.9 | 67.9 | -11% |  |
| Energy Savings – Internal Programs (MWh/year) | 84,997 | 96,430 | 211,814 | 120% |  |
| Energy Savings – External/Customer Programs (MWh/year) | 3,487,896 | 4,840,682 | 5,615,641 | 16% |  |

BUILDING RELATIONSHIPS

| | 2016 | 2017 | 2018 | Annual Change | |
|--|-------|-------|---------|---------------|---|
| Members that Have Formal Stakeholder Engagement Policy | 78% | 91% | 84% | -7% |  |
| Value of Formal Relationships with Indigenous Communities (\$MM) | \$863 | \$829 | \$1,124 | 36% |  |
| Members that Provide Help for Low-Income Customers | 41% | 33% | 42% | 9% |  |

RISK-MANAGEMENT SYSTEMS

| | 2016 | 2017 | 2018 | Annual Change | |
|---|-------|-------|-------|---------------|---|
| NO _x emissions – Intensity (tonnes/net generation) | 1.43 | 1.39 | 1.26 | -9% | ↓ |
| S02 emissions – Intensity (tonnes/net generation) | 2.59 | 2.58 | 2.39 | -7% | ↓ |
| Mercury emissions – Intensity (kg/net generation) | 0.007 | 0.006 | 0.006 | -- | × |
| Number of Priority Spills | 120 | 125 | 213 | 70% | ↑ |
| All Injury/Illness Rate (frequency per 200,000 hours worked) | 1.58 | 1.52 | 1.43 | -6% | ↓ |

Reasons for significant year-over-year performance variations are discussed in the narrative sections of this report.

INFRASTRUCTURE RENEWAL & MODERNIZATION

| | 2016 | 2017 | 2018 | Annual Change | |
|--|-------|-------|-------|---------------|---|
| Total Infrastructure Investments (\$B) | 13.34 | 14.56 | 13.60 | -7% | ↓ |
| Reliability – SAIDI (outage duration) | 5.65 | 7.72 | 8.46 | 10% | ↑ |
| Reliability – SAIFI (outage frequency) | 3.10 | 2.44 | 2.84 | 16% | ↑ |

BUSINESS EXCELLENCE

| | 2016 | 2017 | 2018 | Annual Change | |
|---|--------|--------|--------|---------------|---|
| Total Employee Compensation (\$B) | \$7.18 | \$7.63 | \$7.77 | 2% | ↑ |
| Innovative Tech – Members that Deploy Energy Storage | 50% | 63% | 60% | -3% | ↓ |
| Innovative Tech – Members that Deploy Electrification | 56% | 67% | 60% | -7% | ↓ |
| Female Representation on Boards of Directors | 29% | 32% | 33% | 1% | ↑ |





PILLAR 1

LOW-CARBON FUTURE

The large bulk of Canadian electricity is already GHG-emissions free. CEA members nevertheless remain at the forefront of efforts to push GHG emissions even lower through cleaner generation, effective conservation, expanded use of electricity, and ongoing innovation. They also continued to work to adapt to impacts from global temperature increases. And despite long-standing carbon-reduction efforts within the industry, CEA members achieved a noteworthy 11 per cent further reduction in their total GHG emissions in 2018.

CEA members continued to generate large volumes of renewable and other non-emitting forms of electricity and worked to lighten the carbon footprint from remaining fossil-fuel generation. The Association pushed for a national strategy to guide the evident and growing momentum towards broader use of electricity, as one key element of a decarbonization strategy. Its members also promoted and supported increasingly efficient use of electricity while walking-this-talk in their own operations.

CEA members remain generally well-positioned to operate competitively within various climate-change regulatory frameworks now in place across Canada. This includes the federal carbon “back stop” provisions which came into force in several provinces and the territories in 2019, and which establish a carbon-related charge on fuels and a trading system for large industrial facilities.

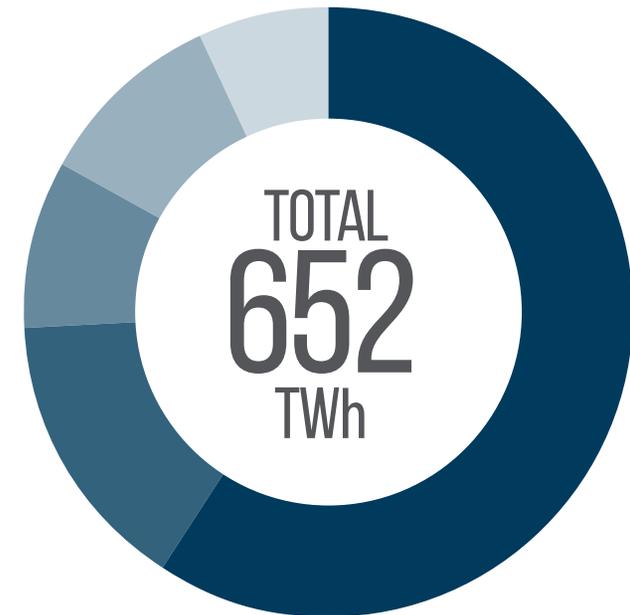
The Association continued to advocate for due regard for the interests of asset owners and communities that will be impacted as retirement of coal generation proceeds, and – more broadly – for regulatory efficiencies that will enable ongoing member investment in further emissions reductions. (See Pillar 5)

ELECTRICITY SECTOR GHGS

| | Results |
|--|-------------------------------|
| Electricity Sector Projected GHG Emissions 2020 | 64 MT |
| Projected Reduction in 2020 Since 2005 | 54 MT / 46% |
| Electricity Sector Projected GHG Emissions 2030 | 34 MT |
| Projected Reduction in 2030 Since 2005 | 84 MT / 71% |
| Canada’s National Reduction Commitment (Paris Agreement) | 30% Below 2005 Levels by 2030 |

Source: [Canada’s 2016 greenhouse gas emissions reference case](#)

BREAKDOWN OF NATIONAL ELECTRICITY GENERATION BY SOURCE, 2017



| | |
|----------------------|-----|
| Hydro | 60% |
| Nuclear | 15% |
| Coal | 9% |
| Gas/Oil/Others | 10% |
| Non-Hydro Renewables | 7% |

Climate Change Management and Mitigation

Greenhouse (GHG) emissions from CEA members totaled 68 million tonnes on a carbon-equivalent basis in 2018, down significantly from 76 million tonnes in the previous year. TransAlta Corporation was one of the major contributors to this improvement, having achieved a 30 per cent year-over-year reduction in its GHG emissions due to coal closures and other coal-generation reductions, including increased co-firing with natural gas.

A modest three per cent year-over-year decline in total net electricity generation contributed to the emissions reduction. Both fossil fuel generation and other forms of generation were down by three per cent in 2018.

The phase-out of conventional coal-based generation continued, with a 16 per cent further decline seen year-over-year.

Future year-over-year carbon reductions are expected to be relatively modest, with a more significant step-down expected in the lead up to what is currently a federally mandated deadline of 2030 for a complete conventional coal generation phase out, subject to possible jurisdiction-specific equivalency measures.

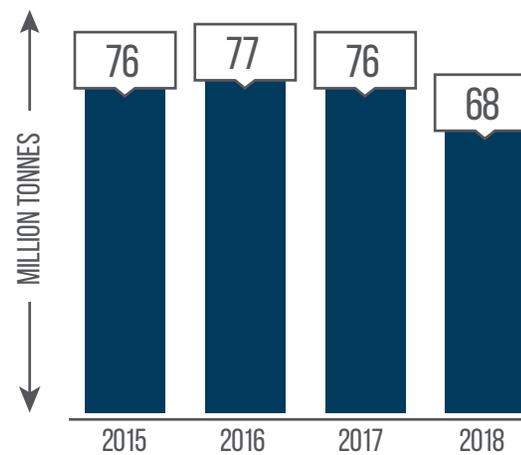
Member-company carbon-reduction and related initiatives in 2018 were multi-faceted and included improved emissions measurement and disclosure and leveraging emerging green financing mechanisms.

In 2018, effects of climate change were noted across the country, impacting the operations of several member companies. Devastating forest fires were seen in Western Canada, the National Capital Region experienced tornados, and New Brunswick was subjected to flooding. These events furthered the importance of and urgent need to increase the resilience of infrastructure and otherwise adapt.

In 2018, CEA further developed its Climate Adaptation Guide, first released in 2017, and developed a series of member training workshops. Engagement during the year with the federal government also led to funding support for these efforts from Natural Resources Canada, which was announced in early 2019. Completion of adaptation plans by all CEA members is targeted by the end of 2020.

ELECTRICITY SECTOR GHG EMISSIONS: 2015-2018

TCO₂ FROM OPERATIONS



39%

OF CEA MEMBERS HAD A CARBON REDUCTION TARGET IN 2018

GHG emissions are intended to include total company emissions from all facilities, including from generation facilities, fleets and buildings. For 2018, not all CEA members were able to report on that basis, and some reported emissions from electricity generation facilities only. All members are expected to report on a corporate-wide basis by 2020, and the Sustainable Electricity Steering Committee continued to work during 2018 on processes and best practices to facilitate fuller and more consistent reporting on the part of all members.

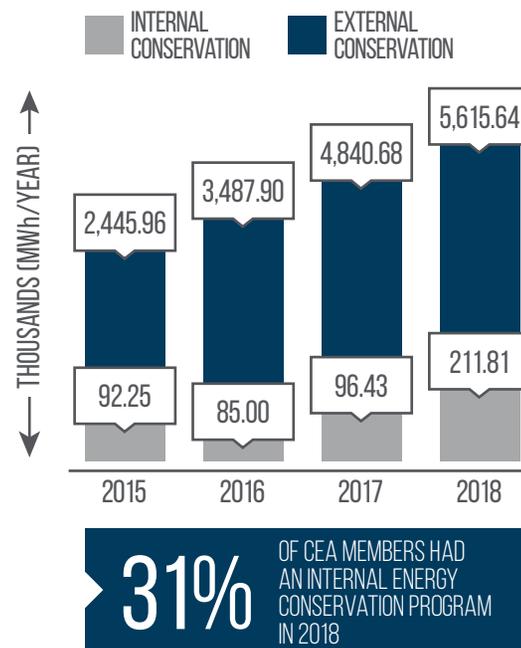
Internal Efficiency, Customer Conservation Programs

The most effective means to reduce energy-related environmental impacts and costs is to reduce the amount that needs to be generated, transmitted, distributed and purchased. CEA members continued to advance conservation and efficient use of electricity, both within the boundaries of their own operations and in the context of end-use by customers.

Internal conservation efforts were driven by formal programs in the case of more than 30 per cent of CEA members in 2018. Member-company initiatives spanned the full value chain, from improved waste-heat capture and use at compressor stations, to the addition of green-building features at office facilities, to wider adoption of e-billing.

External conservation efforts involve formal engagement and collaboration with customers, and the application of CEA member expertise to assist them in improving their end-use efficiency. Distribution companies in particular commonly have large-scale programs entailing incentives, assessments and other assistance for clients seeking better efficiency. An upward trend in the results achieved through such efforts continued in 2018, and the resulting energy savings resulted in 2.7 million tonnes of avoided GHG emissions.

ANNUAL ENERGY SAVED THROUGH CONSERVATION PROGRAMS



The significant increase in internal conservation savings in 2018 is accounted for by the inclusion of results from Hydro-Québec, which had not previously reported on this metric.

Electrification of Transport, Buildings and Industrial Processes

With its enviably high proportion of clean, non-emitting electricity Canada stands to greater GHG reductions than most countries by using electricity to meet a wider range of energy-related needs.

Given the contribution that electrification can make to broader decarbonization – with a trend in this direction already evident most particularly in transportation – it’s been estimated that it could boost electricity demand by between 24 and 52 per cent by 2050¹.

However, clarity is needed on how electrification should be extended within the Canadian economy. CEA advocated in 2018 for a clear national strategy defining what electrification will look like in Canada, how it is going to be pursued, and what the timelines will be. Such a strategy will need to fit within the context of use of multiple decarbonization levers and ongoing innovation and will need to recognize that the most cost-effective approaches will vary from one region to another.

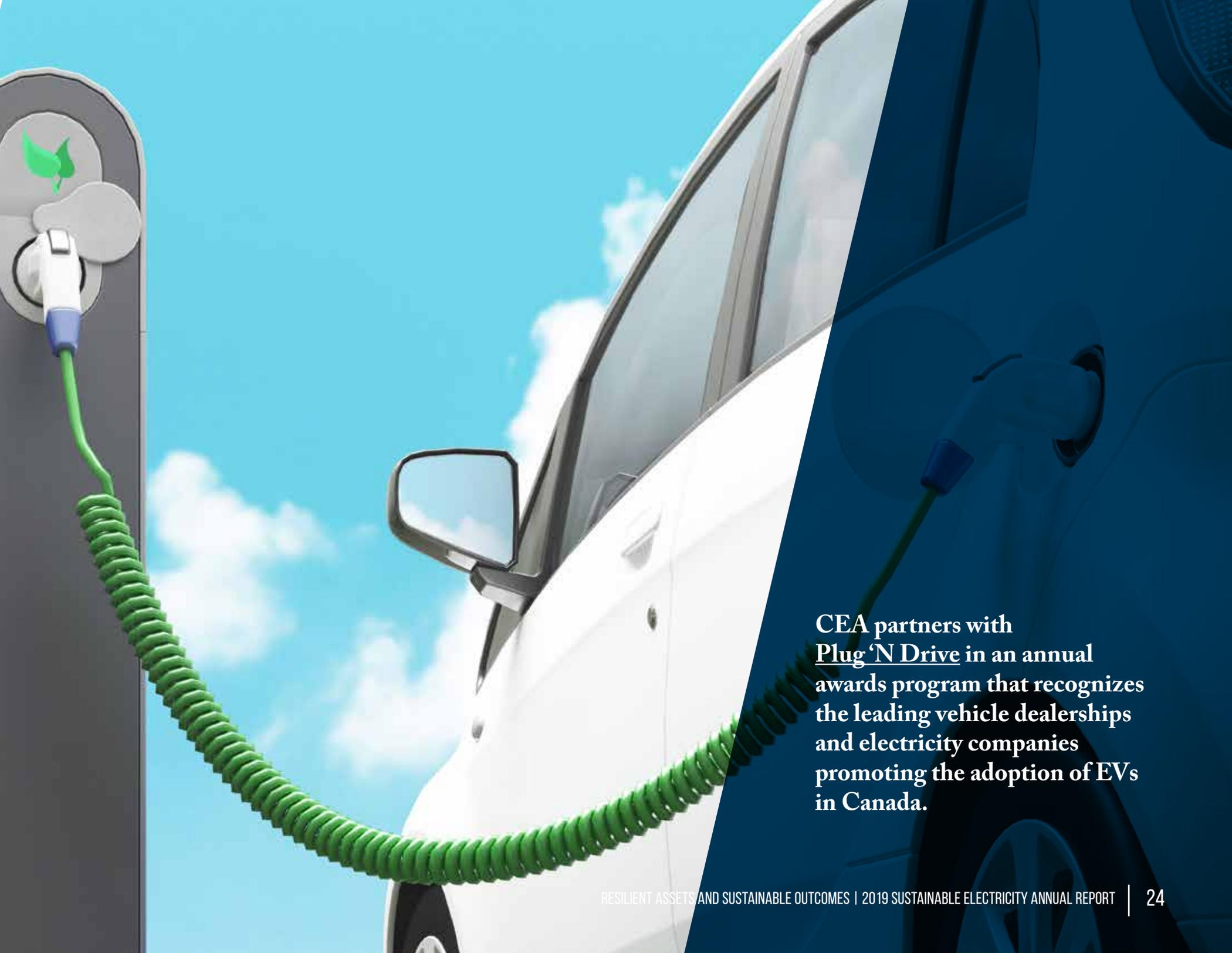
While a roadmap of that type has yet to emerge, the potential importance of the electrification lever was underscored in other contexts, including the [report of the Generation Energy Council](#) and the December First Ministers meeting.

Sixty per cent of CEA members reported involvement in electrification initiatives in 2018. CEA advocated for regulatory approaches and infrastructure development to accelerate electrification momentum and welcomed new provision for accelerated write-offs for the cost of electric vehicle chargers. Outstanding priorities include ensuring access to the consumption data and investment capital members will need to adapt to the significantly different demand patterns EVs will create.

¹ Electric Power Research Institute (EPRI), The US National Electrification Assessment, April 2018.

Opportunity for Improvement:

How deep should we need to drive electrification, and how can we best align it with other decarbonisation strategies? A low-carbon economy will rely more heavily on electricity, but we have no consensus on precisely to what extent or on the key steps to enable that. Without such a strategy – which CEA actively advocates for – we’re much less likely to make the optimal and regionally appropriate investments to get us to where we need to be in a timely and efficient way.



CEA partners with Plug 'N Drive in an annual awards program that recognizes the leading vehicle dealerships and electricity companies promoting the adoption of EVs in Canada.

Member Action to Reduce Carbon

The Power of the Prairie Sun

SaskPower plans to have 60 MW of solar generation by 2021 and got a good start towards that goal with its announcement of Saskatchewan's first utility-scale solar power project. Through a competitive process, SaskPower selected Saturn Power as the proponent to build the 10 MW Highfield Solar Project, which has a 20-year power purchase agreement and will be located in the Rural Municipality of Coulee. SaskPower is working to reduce its greenhouse emissions by 40 per cent below 2005 levels by 2030, which will involve bumping renewable electricity from 25 to as much as 50 per cent of overall capacity.

Measuring Emissions from the Depths

While the actual production of hydroelectricity generates no greenhouse gases, the reservoirs that form an essential part of many hydro projects have the potential to do so. Brookfield Renewable Canada is at the forefront of efforts to better understand and assess this possible emissions source, and in 2018 was able to conclude that its reservoirs – all older than 15 years – are not significant contributors to incremental global greenhouse gas or methane emissions. Brookfield Renewable Canada deploys the International Hydropower Association's recently launched "G-res Tool", and research from the Centre for Energy Advancement through Technological Innovation, to arrive at holistic and standardized modeling of its reservoir emissions.

Putting EVs out in the Cold

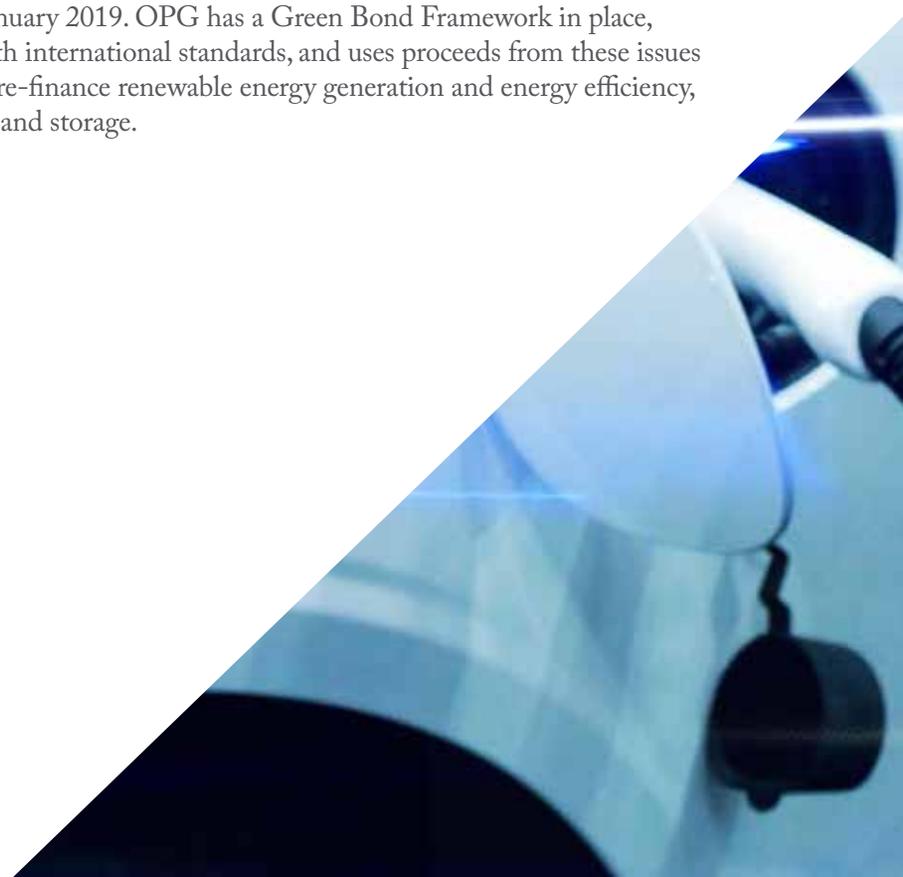
There aren't a lot of cars in Churchill Falls, Labrador – a company town with a population of 650, and home to the people who operate the generating station of the same name – but as of 2018 one of them has an electric vehicle. The town manager is driving the EV, as part of an 18-month pilot project to assess the viability of non-combustion vehicles in an environment where winters are long, and temperatures can drop to -40 degrees. Comparative mileage, operational and maintenance costs are being tracked, in an effort to help extend the reach of the electrification of light-duty vehicles.

Taking the Heat off Compressor Stations

TC Energy is now converting the waste heat from gas turbine exhaust at one of its southern Alberta compressor stations into emissions-free electricity, in the first commercial application of technology using Supercritical Carbon Dioxide as the heat recovery fluid. Expected to be completed by 2021, the project has the potential to cut 44,000 tonnes of greenhouse gases annually and to power more than 10,000 homes. It is being developed in partnership with Siemens and was selected by Emissions Reduction Alberta as one of 11 projects launched under its Industrial Efficiency Challenge.

Finding Financing for a Green Future

There's burgeoning interest on the part of investors and others in green bonds and similar mechanisms, designed to channel investment capital towards clean energy and other environmentally beneficial projects. Ontario Power Generation (OPG) leveraged this trend in 2018 with a \$450 million inaugural green bond offering, which it followed with a second \$500 million offering in January 2019. OPG has a Green Bond Framework in place, consistent with international standards, and uses proceeds from these issues to finance or re-finance renewable energy generation and energy efficiency, management and storage.







PILLAR 2

INFRASTRUCTURE RENEWAL AND MODERNIZATION

The total investment requirement in electricity generation alone over the next three decades has been estimated at \$1.7² trillion, driven in part by the transformational projects needed to achieve ambitious carbon reduction objectives. Additional drivers include population - and electrification - driven demand growth, and the need to both replace aging infrastructure and to improve infrastructure resiliency in the face of extreme weather impacts.

CEA members are making significant investments, and in 2018 electricity industry projects continued to dominate the ranking of the largest infrastructure investments underway in Canada³. Various factors, however, act as a drag on investment levels and pose a risk to the long-term sufficiency and reliability of electricity supply.

These include excessive regulatory and taxation burdens that create delays; uncertainty and higher capital costs for project developers; stakeholder opposition to some projects; and cost sensitivities that often translate into political and regulatory reluctance to greenlight necessary spending.

² The Conference Board of Canada, Climate Change and Infrastructure, 2018

³ ReNew Canada's Top 100 Infrastructure Projects

Powering the North

While population centres in southern Canada enjoy a highly reliable and increasingly green electricity supply, northern and remote communities suffer the effects of energy inequality. Reliance on expensive diesel generation both impacts the environment and constrains economic growth.

CEA was vocal during 2018 on the need to improve northern electricity infrastructure. Concurrent with a first-ever meeting of its board in the North, CEA hosted a symposium in the Yukon on regional energy needs. This led to a call for added federal support to improve the efficiency of existing northern generation, and for transmission investments to end the North's energy isolation.

Opportunity for Improvement:

Are we investing for business-as-usual, or for the new realities that energy-related transformation will bring about? Industry infrastructure investment levels are likely sufficient for like-for-like, end-of-life replacement. But they are not sufficient to support higher end-use demand and deeper decarbonisation – nor are rate-setting regulators ready to allow them to be. CEA is working on more robust benchmarking of actual vs. required investment levels.

Investments in New and Refurbished Infrastructure

CEA members continued to make an annual investment of more than \$13 billion in new and refurbished infrastructure in 2018, down seven per cent from 2017 but higher than in 2014-16. A relatively large year-over-year moderation in transmission investment was partially offset by higher distribution investments. The largest individual member spends were on the part of Hydro-Québec at \$3.24 billion and Manitoba Hydro at \$2.81 billion. CEA member infrastructure projects are often among the largest projects in Canada.

Canada's Top 10 Infrastructure Projects 2018

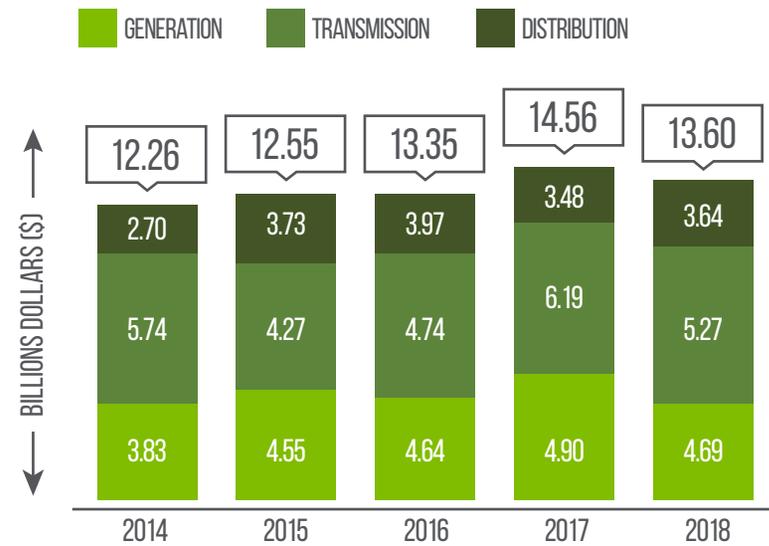
- Bruce Power Refurbishment
- Darlington Nuclear Refurbishment
- Muskrat Falls Project
- Site C Clean Energy Project
- Eglinton Crosstown LRT
- Keeyask Hydroelectric Project
- Romaine Complex
- Réseau électrique métropolitain
- Bipole III Transmission Line
- Southwest Calgary Ring Road

Source: [ReNew Canada Magazine](#)

New Investment, New Partnerships:

Federal funding support was announced in 2018 for the Wataynikaneyap Power Transmission Line project which will connect 17 First Nations to Ontario's power grid and displace diesel fuel use. Wataynikaneyap Power is jointly owned by a group of First Nations and CEA member company Fortis Inc. The transmission line will be Canada's largest First Nations-led infrastructure project to date and is indicative of the growing Indigenous role in project development.

INVESTMENTS: NEW AND REFRUBISHED INFRASTRUCTURE



Integration of Renewable Energy

CEA members generated, enabled and purchased a total of 30,626 gigawatt-hours of renewable electricity in 2018 (in addition to much large volumes of hydroelectric and nuclear generation, which are also non-emitting). This was comparable to 2017 generation and purchases, and wind continued to represent the large bulk of renewable generation.

CEA members continued to invest in 2018 not only in new renewable generation, but in other infrastructure and technology needed to reliably integrate green energy supply into the grid. Member-company initiatives focused on renewables use within remote communities served by isolated micro-grids, on maintaining power quality, and on developing effective storage technologies, among other challenges.

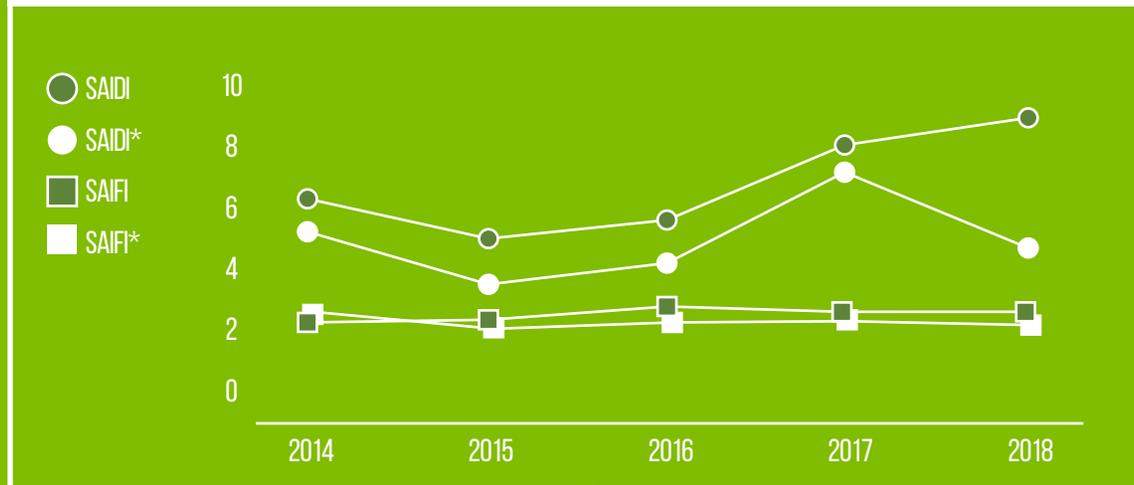
System Reliability and Resiliency

In part due to extreme weather events in regions across the country, 2018 was a challenging year in terms of both the duration and frequency of power interruptions experienced by customers. The index value for outage duration was at its highest level in the past five years, although with the exclusion of extreme weather events it was down from 2017⁴.

The index values for outage frequency (both total and when excluding extreme weather events) were within the same range where they have been for the past several years.

Improving the resilience of electricity infrastructure in the face of more frequent extreme weather events is a key component of the climate adaptation plans that all CEA members are developing. Members are also continuously working to leverage technological advancements that enable them to better detect and more quickly respond to outages when they occur.

RELIABILITY MEASURES



- **System Average Interruption Duration Index**
total length of outages over one minute long divided by number of customers

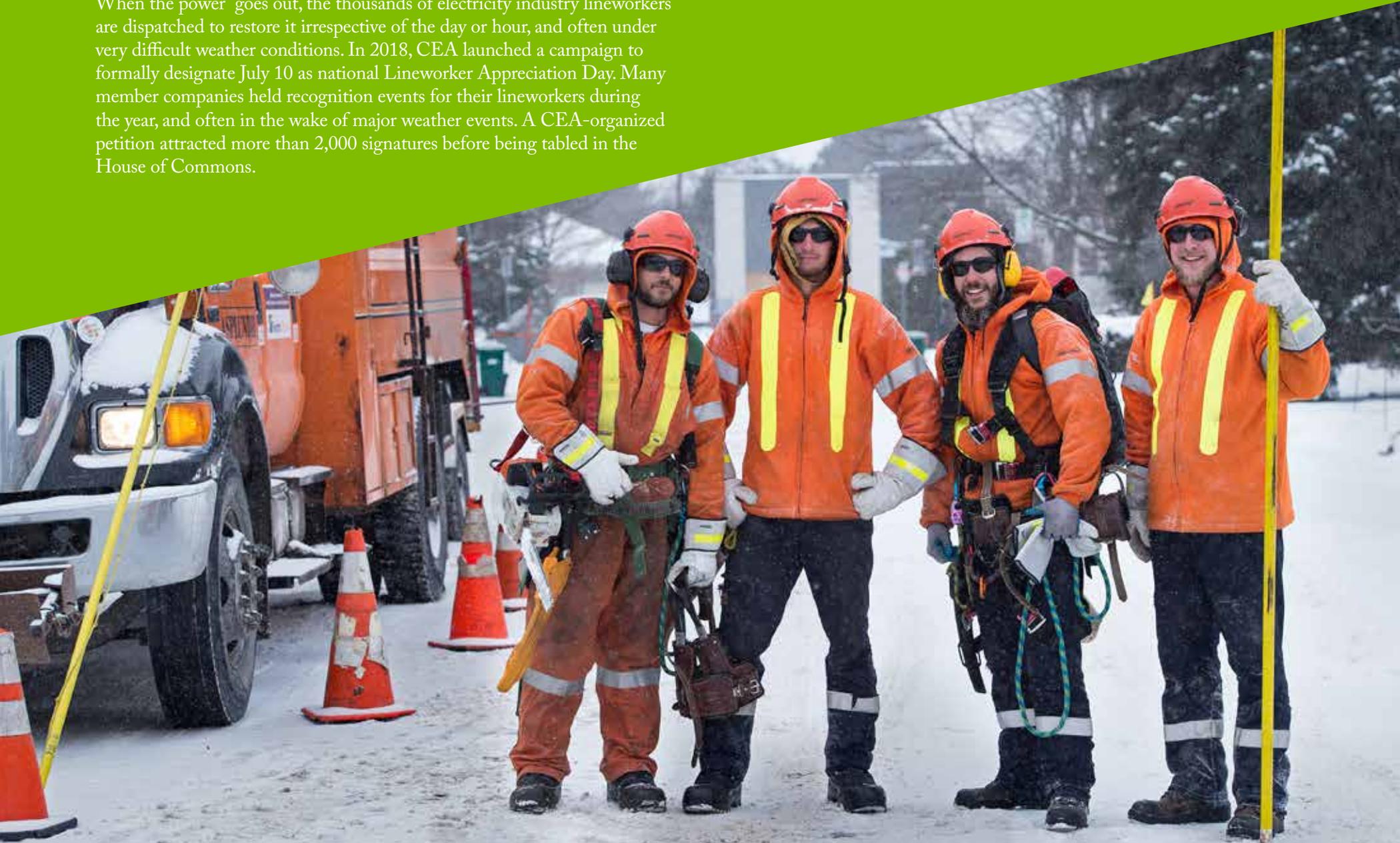
- **System Average Interruption Frequency Index**
total number of outages over one minute long divided by number of customers

* excluding extreme weather events

⁴ Duration measures jumped in 2017 due in part to the inclusion from that year forward of remote areas not connected to the national electricity grid which are more prone to outages.

On the Front Lines

When the power goes out, the thousands of electricity industry lineworkers are dispatched to restore it irrespective of the day or hour, and often under very difficult weather conditions. In 2018, CEA launched a campaign to formally designate July 10 as national Lineworker Appreciation Day. Many member companies held recognition events for their lineworkers during the year, and often in the wake of major weather events. A CEA-organized petition attracted more than 2,000 signatures before being tabled in the House of Commons.



Member Action to Renew Infrastructure

Bipole III Transmission Line Proves its Resilience

Manitoba Hydro's \$4.7 billion Bipole III transmission project went into service in 2018, providing the capacity needed to meet the needs of future generations in a growing province. Previously, over 70 per cent of the electricity generated in Manitoba was delivered over two existing transmission lines that ran alongside each other for much of their route, creating a reliability risk in the event of a major weather event. And in August, Bipole III proved it has the resilience to withstand even a direct tornado hit. Bringing it into service also made it possible to retire Manitoba Hydro's last coal-burning power unit.

Automating Historic Downtown Oakville

Along with historic character and charm sometimes come the limitations of older infrastructure. In downtown Oakville that means an electrical grid that isn't fully visible to the utility's control centre, has limited capacity to integrate distributed generation, and requires manual responses when power is interrupted. Oakville Hydro began a multi-year upgrade project in 2018 to address these limitations and enable automatic power restoration. With support from Ontario's Smart Grid Fund, and working with S&C Electric, the utility will deploy new technology and equipment that will provide greater automation and also improve its overall management of electrical assets in the downtown core.

Ending Electrical Isolation on The Rock

In January 2018, Emera Newfoundland and Labrador put the Maritime Link high-voltage, direct-current transmission project into service, joining formerly isolated Newfoundland to Nova Scotia by subsea cable. These now-interconnected grids can share backup capacity and provide emergency assistance when needed and are enjoying enhanced reliability thanks to the Maritime Link. The new connection will also be part of the means by which power from the Muskrat Falls generation project in Labrador ultimately reaches Nova Scotia and beyond, helping to support that province in further reducing its reliance on coal-generated electricity.

Keeping the Spillway Gates Closed

Electricity infrastructure is often long-lived, and in the case of FortisBC's Corra Linn Dam on the Kootenay River, commissioning dates back to the early 1930s. In 2018, FortisBC began a major upgrade at this generating facility, entailing replacement of all 14 spillway gates and rehabilitation of associated infrastructure. This was driven in part by regulatory changes that saw an upgrade of both the anticipated severity of the potential consequences associated with a failure of this dam, and of the magnitude of the floods and earthquakes that the dam is required to be able to withstand.

Solving a Different Type of Urban Gridlock

In Calgary and many other cities, some segments of the electricity distribution network can accommodate customer generation from solar panels, and sale of the resulting power, while other secondary portions of the network aren't currently configured for the necessary two-way flow of power. ENMAX, with funding support from Natural Resources Canada and Alberta Innovates, is demonstrating how innovative modifications – to hardware, software and communications systems, can enable two-way flows even on the secondary portions of the grid. This may ultimately give more urban electricity consumers, in Calgary and elsewhere, the opportunity to also become generators.

Stashing Renewable Energy for When it's Really Needed

Energy storage is key to unlocking the full potential of renewable energy sources, and Maritime Electric has partnered with Stash Energy – a student engineering company at the University of New Brunswick – to evaluate potential commercialization of storage in combination with heat pump applications for heating and cooling. The Stash system works with conventional heat pump technology, which there's been rapid uptake on in Prince Edward Island in recent years to store thermal energy when electricity demand is lower. This stored energy can then be used to during times of peak electricity use, usually in the early evenings, to help reduce peak load on the system.



PILLAR 3

BUILDING RELATIONSHIPS

Relationship-building is extremely important in the operation of electricity facilities and infrastructure, as well as a determinant of corporate and sectoral success more broadly, and only becoming more so.

Early engagement and consultation with affected stakeholders are a necessity when considering new project development or significant alterations to existing operations. Consistent with national efforts to advance reconciliation, this must incorporate engagement tailored specifically to Indigenous interests and circumstances.

Consumer-facing CEA members also recognize that they are no longer undifferentiated suppliers of a commodity. They too are continually working to better understand their customers' evolving needs for often highly tailored services and information, and to both widen and deepen the relationships they build with them.

Early Engagement and Consultation

A large majority of CEA members have formal engagement policies and processes for identifying stakeholder concerns and opportunities in relation to their operations and project development. Equally large majorities have formally identified the Indigenous groups within their service and operating areas, and have procedures requiring early consultation and engagement with those groups during project planning and development.

Increasingly, Indigenous engagement includes mutually advantageous business relationships. The value of these relationships – consisting mainly of supply arrangements for goods and services, but also of joint ventures and equity participation – increased significantly in 2018 to exceed \$1 billion.

CEA members adhere to six CEA-developed National Principles for engagement of Indigenous Peoples. These principles, outlined below, were formally adopted by CEA's Board of Directors in 2017. They are:

- Respecting Indigenous culture, traditional values and rights
- Nurturing constructive relationships
- Enhancing communications
- Fostering Indigenous capacity building
- Promoting economic prosperity
- Facilitating Crown Consultation

On a Path to Reconciliation:

Canada as a whole is working to renew its relationship with Indigenous peoples, and the electricity industry is doing its part to advance the effort. [A compilation was prepared in 2018 of diverse CEA member Indigenous engagement initiatives.](#) They relate to the Truth and Reconciliation Commission's 2015 calls-to-action, and encompass education, employment and training, business partnerships and capacity building.

Opportunity for Improvement:

How do we know when we're getting Indigenous engagement right? Reconciliation involves applying crucial but necessarily broad principles and seeking long-term and sometimes difficult-to-quantify outcomes. In 2018 the CEA nevertheless began to develop measurable performance indicators relative to the Indigenous engagement principles its members have committed to.

MEMBERS THAT HAVE FORMAL STAKEHOLDER ENGAGEMENT POLICY

Including processes to identify stakeholder concerns and opportunities

| 2015 | 2016 | 2017 | 2018 |
|------|------|------|------|
| 88% | 78% | 91% | 84% |

The sub-set of CEA members responding to this question varies in both size and composition from one year to the next. Longer-term trends are therefore more meaningful than specific year-to-year variation.

INDIGENOUS RELATIONS POLICIES (%)

| | 2015 | 2016 | 2017 | 2018 |
|---|------|------|------|------|
| Members that Have Formally Identified Local Indigenous Groups within Service Area | 77% | 81% | 72% | 84% |
| Members that Have Procedures Requiring Early Engagement During Project Planning and Development | 79% | 81% | 81% | 88% |

The sub-set of CEA members responding to these questions varies in both size and composition from one year to the next. Longer-term trends are therefore more meaningful than specific year-to-year variation.

VALUE OF FORMAL RELATIONSHIPS WITH INDIGENOUS COMMUNITIES (\$MM)

| 2015 | 2016 | 2017 | 2018 |
|---------|-------|-------|---------|
| \$1,032 | \$863 | \$829 | \$1,124 |



Support for Low-Income Customers

More than 40 per cent of CEA members offered programs to help low-income customers with their bills in 2018, often although not always in response to a regulatory requirement. While Canadian electricity remains comparatively inexpensive by international benchmarks, these programs reflect the challenge that the cost of this essential service can nevertheless pose for some households.

| LOW INCOME CUSTOMERS | | | | |
|--|------|------|------|------|
| | 2015 | 2016 | 2017 | 2018 |
| Members that Provide Help for Low-Income Customers | 28% | 41% | 33% | 42% |
| Members that do this in Response to Government Requirement | 27% | 28% | 19% | 28% |

The sub-set of CEA members to which these questions are relevant varies in both size and composition from one year to the next. Longer-term trends are therefore more meaningful than specific year-to-year variation.

Enhanced Customer Experience

About three-quarters of CEA member companies continued to conduct customer surveys in 2018 by a variety of means. This is particularly useful for distribution company members that serve large numbers of customers, with increasingly varied service offerings.

Surveys give electricity utilities a sightline on customer satisfaction and help inform the refinement and development of their offerings. They are commonly supplemented by various other touchpoints with customers, including open houses, social media interaction, and dialogue with specific stakeholders such as community and local business associations.

CEA conducted its own National Customer Survey in 2018 which showed continued improvement in all satisfaction measures, as well as a strong customer interest in conservation, with costs savings being the main motivator.

| MEMBERS THAT CONDUCT CUSTOMER SATISFACTION SURVEYS | | | | |
|--|------|------|------|------|
| | 2015 | 2016 | 2017 | 2018 |
| | 59% | 75% | 73% | 74% |

The sub-set of CEA members to which this question is relevant varies in both size and composition from one year to the next. Longer-term trends are therefore more meaningful than specific year-to-year variation.



Member Action to Build Relationships

On the Reconciliation and Pilgrimage Pathway

The Lac Ste. Anne Pilgrimage in northern Alberta dates back to 1889 and is the largest Indigenous Catholic gathering in Canada, now attracting more than 30,000 participants. As part of its efforts to build and maintain strong relationships with Indigenous neighbours – in this case specifically the Gunn Métis Local 55 – TransAlta has funded purchase of tents, tables and chairs for this unique and historically important event. Participants travel from across Western Canada to attend the multi-cultural spiritual and social gathering, with some of them doing so on foot.

Casting a Wide Net for Local Input

As part of its preparation to connect the Îles-de-la-Madeleine to the main provincial grid via a 225-km underwater link, Hydro-Québec sought local input to better understand and accommodate fishing activity around the archipelago. While this included meetings, fishermen could also take part in the dialogue at their convenience via what proved to be a widely used interactive map. When commissioned in 2025, the new link will enable on-island thermal generation to be used for back-up only, and a new local microgrid will incorporate wind generation and other innovative energy solutions.

Foreseeing the Flood and its Impacts

When the Saint John and Kennebecasis Rivers flooded in spring 2018, Saint John Energy's state-of-readiness was more precise than ever. A mapping simulation system had been used to predict what specific equipment and customers were at risk, and which areas would be isolated at various flooding levels. This allowed for pre-staging of vehicles and equipment before specific areas became cut off by water, and for development of property-specific access plans. It also enabled service disconnect decisions to be made more precisely, and dramatically reduced the number actually implemented. Guided by the mantra "what if this was our home?" the utility was in touch with at-risk customers daily.

Looking Back on a Milestone Settlement

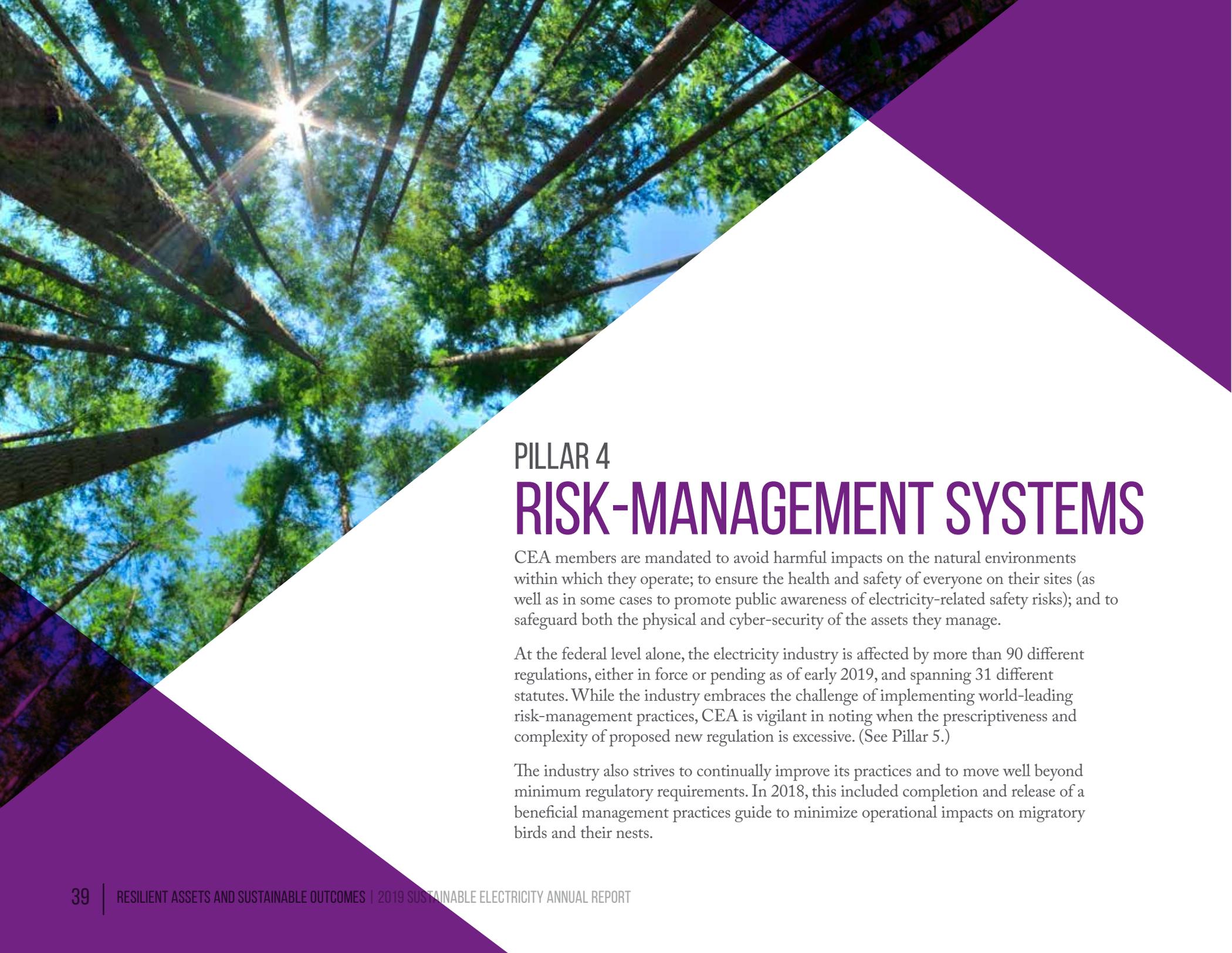
Ontario Power Generation's St. Lawrence Power Development Visitor Centre was the site of an October gathering marking the 10th anniversary of the final settlement agreement between OPG and the Mohawk Council of Akwesasne. The outcome of 15 years of negotiations, the settlement acknowledged past wrongs on the part of OPG's predecessor company during the development of power operations along the river in the 1950s. It entailed a public apology and provided a foundation for a new partnership that has resulted in environmental initiatives and employment and capacity building.

Celebrating Energy Efficiency Partnerships

Newfoundland Power launched its Luminary Awards program, celebrating businesses, municipalities, individuals, suppliers and retailers who have made noteworthy efforts relating to energy efficiency. This included recognition of the participants in its takeCHARGE Business Efficiency Program that achieved the most significant increase in its energy savings. takeCHARGE is a joint initiative of Newfoundland Power and Newfoundland and Labrador Hydro, through which they provide energy-efficiency expertise, information and rebates to customers.

Backing up to Take Account of Community Concerns

Toronto Hydro's original plan for a backup power source for the Eglinton Crosstown Light Rail Transit (LRT) Project was a natural gas-fired Combined Heat and Power (CHP) plant, but discussions with the local community revealed concern about the environmental impact of the emissions. The project was re-evaluated with input from the community, and an environmentally friendly battery storage facility was selected instead. The project includes a 90 kW rooftop solar PV system, and a 10MW/40 MWh lithium-ion battery for energy storage (the equivalent of enough energy to power approximately 11,000 homes).



PILLAR 4

RISK-MANAGEMENT SYSTEMS

CEA members are mandated to avoid harmful impacts on the natural environments within which they operate; to ensure the health and safety of everyone on their sites (as well as in some cases to promote public awareness of electricity-related safety risks); and to safeguard both the physical and cyber-security of the assets they manage.

At the federal level alone, the electricity industry is affected by more than 90 different regulations, either in force or pending as of early 2019, and spanning 31 different statutes. While the industry embraces the challenge of implementing world-leading risk-management practices, CEA is vigilant in noting when the prescriptiveness and complexity of proposed new regulation is excessive. (See Pillar 5.)

The industry also strives to continually improve its practices and to move well beyond minimum regulatory requirements. In 2018, this included completion and release of a beneficial management practices guide to minimize operational impacts on migratory birds and their nests.

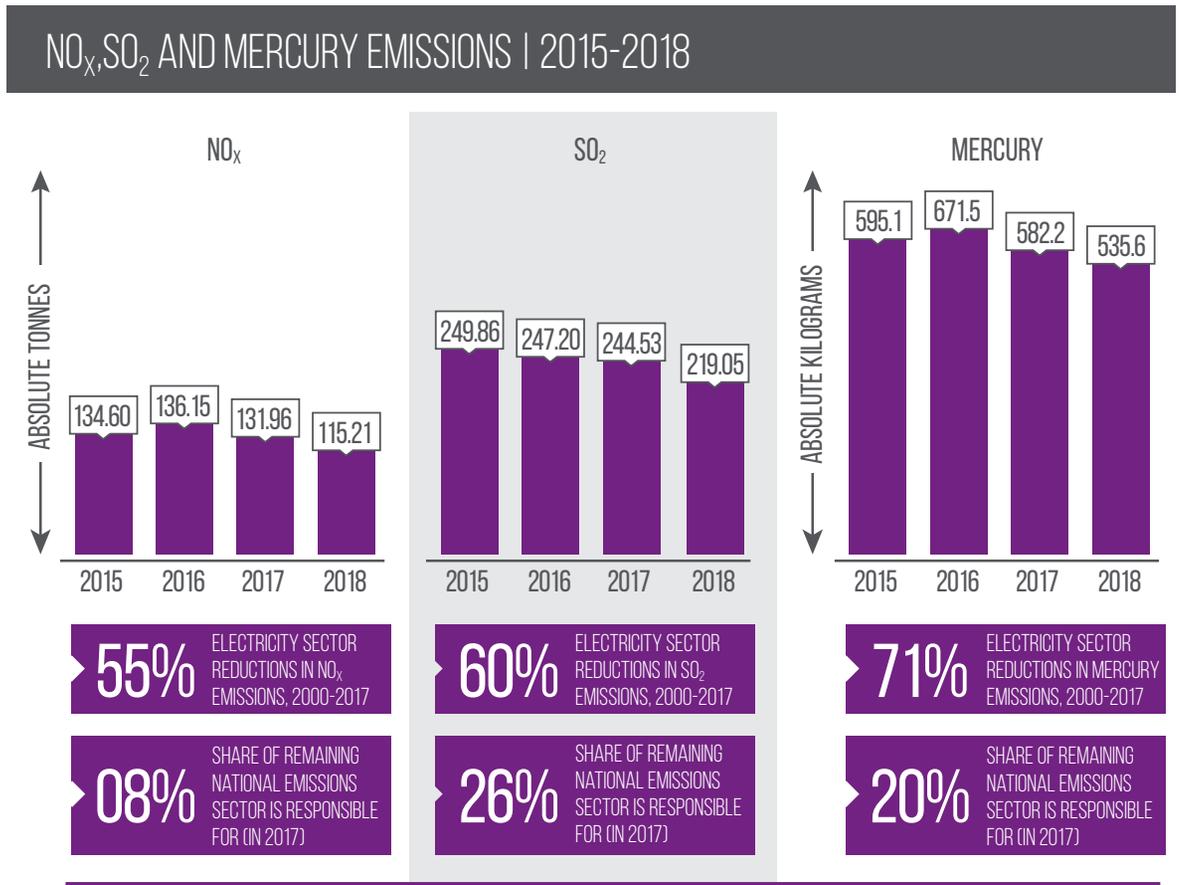
A CEA Biodiversity Network was also created, as a forum for member information sharing and collaboration.

Maintaining the highest safety standards to safeguard the well-being of employees, contractors and anyone else on or near member operations or equipment, is universally considered “table stakes” by CEA members, who at the same time work to continuously improve safety outcomes.

Environmental Stewardship

Nitrogen oxides, sulphur dioxide and mercury emissions have been a long-standing reduction focal point, and electricity industry emission levels for these pollutants closely follow coal-fired electricity generation and tend to move in tandem with greenhouse gas emissions. Consistent with the significant reduction in greenhouse gases during 2018, nitrogen oxide emissions were down 13 per cent year-over-year, sulphur oxide emissions were down 10 per cent, and mercury emissions were down eight per cent on an absolute basis.

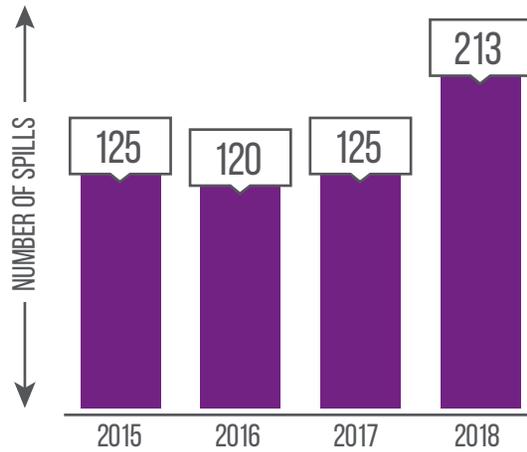
Longer-term reduction trends have been significant, with the reductions since 2000 ranging from more than half to close to three-quarters. Electricity generation accounts for roughly the same share of national emissions of each of these substances as it did in 2000. Significant proportions of remaining emissions are associated with conventional coal facilities due for phase out by 2030.



Priority spills are defined with reference to volume, substance and the environment into which the spill occurred. Rigorous detection, containment and response procedures are in place. A significant increase in 2018 was attributable to specific circumstances applicable at one member’s operation, as described in the notation below the data table.

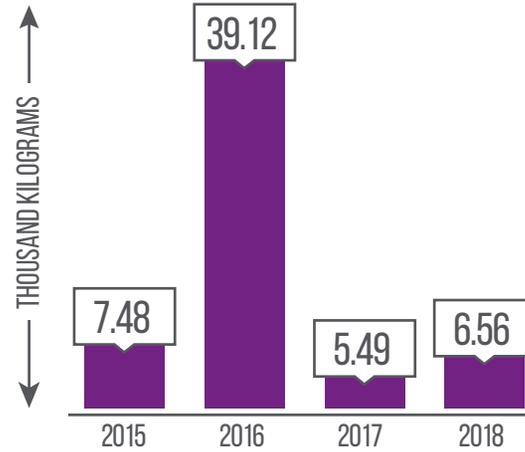
Sulphur hexafluoride (SF₆) is a highly effective electrical insulator, and a substitute for polychlorinated biphenyls (PCBs), but also a highly potent contributor to GHG emissions. Usage is tracked based on the weight required to top up equipment for maintenance purposes.

ANNUAL PRIORITY SPILLS



The significant increase in 2018 is accounted for in part by precautionary and more rigorous spill identification procedures implemented by Toronto Hydro; the majority of these spills were small in volume (<10L) and/or consisted of mineral oil that has been found to not be detrimental to the environment.

SF₆ USAGE FOR MAINTENANCE PURPOSES (KG)



The large increase in 2016 is attributable to an equipment failure at a Hydro-Québec sub-station. Given the specific circumstances, the loss of SF₆ was calculated by subtracting the amount recovered at the sub-station, from the average nominal capacity of SF₆ in use across all of the utility's sub-stations. While this methodology was required for the purposes of the independent verification of Hydro-Québec's response, it over-estimated actual SF₆ emissions.



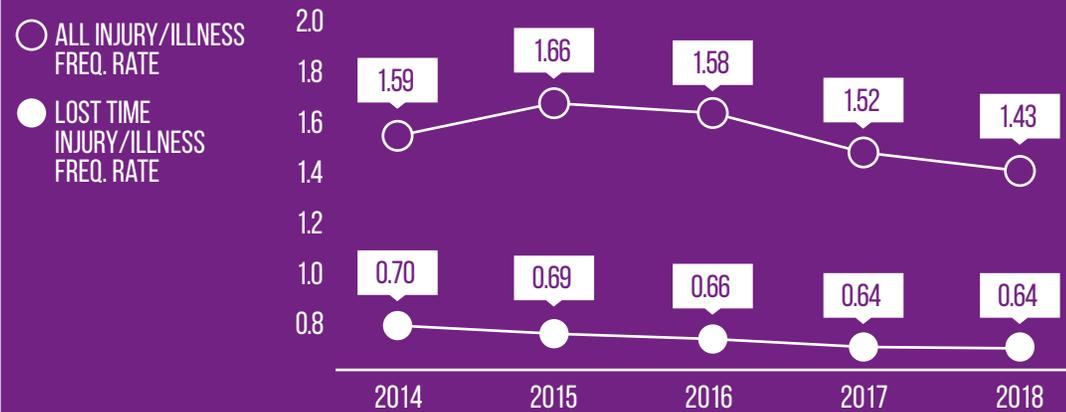
Employee, Contractor and Public Health and Safety

A variety of potential safety risks are inherent in the operation of electrical facilities, and CEA member companies invest extensively in safety management systems, standards and practices; along with awareness and other prevention programs, and emergency response procedures. Safety results and trends are carefully monitored, so as to address any gaps in this crucial aspect of risk management.

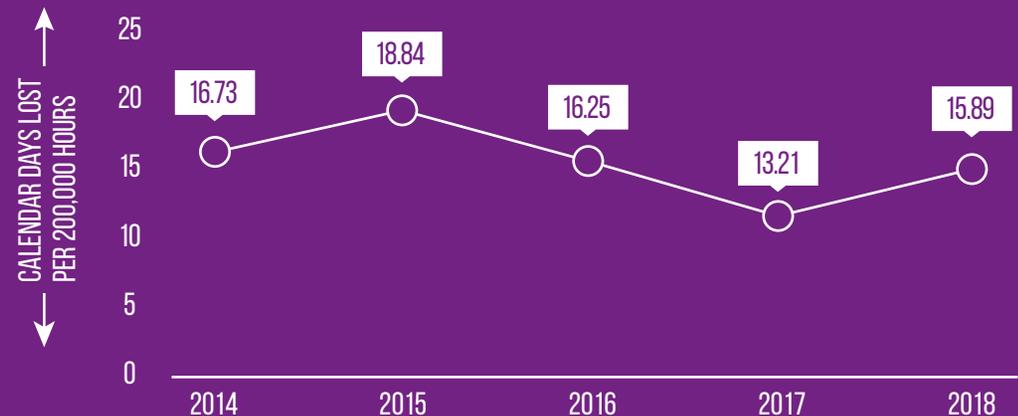
During 2018, there was a further reduction in the frequency of workplace injuries as a whole, while the frequency of the more serious sub-set of them that resulted in time away from work held steady. In contrast, the severity of injuries as measured by resulting days lost due to injury was up.

Member-company health and safety initiatives in 2018 were in some cases more holistic, including for example a focus on employee mental health. Members also undertook awareness and educational campaigns targeting audiences such as the construction and agricultural sectors and maintained close collaboration with local emergency response agencies. Some also began assessing the newly published ISO 45001 occupational health and safety standard, for potential adoption in the future.

ALL INJURY/ILLNESS AND LOST TIME INJURY FREQUENCY RATE



LOST-TIME INJURY SEVERITY RATE



Opportunity for Improvement:

How can we accelerate health and safety improvement? Crucial though it is to track metrics like accident frequency and severity, they provide a rear-window view of what's already happened. Breaking through to the next level of safety performance will require a sharper focus on leading rather than lagging measures – such as trends relating to safety near-misses – and on strong preventative efforts.

Security Management Systems and Standards

CEA members own and operate some of the most critically important infrastructure upon which Canadians rely, and in 2018 continued to build its resilience against ever evolving cyber-security threats.

CEA helps build and foster security partnerships with government, including the recently created Canadian Centre for Cyber Security, to improve threat identification and response capabilities. It is also active in cross-border forums and initiatives aimed at protecting the integrated Canada-U.S. electricity grid against cyber threats.

Member-company cyber-security initiatives in 2018 included, among others, equipping employees with better awareness of risk factors such as phishing, and implementation of added controls against risk factors such as unauthorized logins; members also take part periodically in multi-party simulations and preparedness exercises.



Member Action to Lower Risk

Pursuing Perfection on Safety

Alectra introduced “AlectraSafe Safety Perfect Days” in 2018. In addition to such obvious markers of good safety performance as no personal injuries, no preventable vehicle incidents and no environmental spills, a “perfect” designation also requires that a near-miss incident or hazard be reported to a supervisor for correction. That latter criterion is an indication that learning and improvement have occurred within the organization. The company recorded 72 Safety Perfect Days in 2018, and 291 potential days, which had all the right ingredients except for reporting of a near miss or hazard.

Look. Locate. Live.

FortisAlberta intensified its promotion of public electrical safety in 2018. It made more than 120 presentations, mainly to firefighters, people within the agricultural sector, and construction equipment operators – all of whose work can give rise to electricity-related risks. Specific awareness campaigns targeted farmers and construction workers in Alberta with reminders of the need to be conscious of safety when working around overhead and underground power lines. The latter campaign was carried out by the province’s Joint Utility Safety Team (JUST) of which FortisAlberta is an active member.

Safeguarding the Agricultural Sector

Manitoba Hydro has developed and implemented biosecurity operating procedures to limit the risk of causing damage – such as introduction of invasive species or crop disease – to the province’s vital agricultural sector. When work takes place on agricultural land, soil conditions and other risk factors are assessed, and prescribed actions then come into play. Employees are trained in biosecurity measures, and equipment and vehicles arrive on site free of weeds, soil and debris, with cleaning kits and disinfectants on hand when needed. Specific biosecurity monitoring measures are put in place on large projects such as transmission line builds.

Making Risk Transparent to Investors

Climate change-related risk is of growing interest to investors and many other stakeholders, and Capital Power worked to further evolve its disclosure practices. Specifically, it developed an inaugural Climate Change Disclosure based on recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) – an international initiative widely recognized as establishing an important new benchmark in this regard. Released in 2019, Capital Power’s disclosure identified the elements of the TCFD recommendations that the company already addresses, set out three climate scenarios that will be the basis for future analysis, and provided an initial assessment of existing risks and opportunities.

Safety in the Skies

Landfill sites present a sometimes-fatal set of risk factors for eagles and other birds. Landfill operational requirements mean that powerlines often cross over areas where organic waste attracts birds. Birds in turn often pick up plastic waste on their feet, which increases the risk of fatality if it comes into contact with live wires while the birds are in-flight or landing. In 2018 Nova Scotia Power tested cover materials for the lines, and installation of perches and triangles on poles at the Guysborough landfill site. The project continued into 2019, together with additional bird mortality mitigation efforts, and with initial results indicating a significant reduction in eagle deaths due to the new measures at Guysborough.

Forest Fires: Lowering an Elevated Risk

AltaLink, along with other Alberta-based utilities, is part of a Powerline Wildfire Prevention Task Group that is mobilizing to develop strategies and recommendations to reduce powerline-caused forest fires. About 15 per cent of AltaLink’s assets are located within Alberta’s Forest Prevention Zone, and while fewer than three per cent of wildfires over a recent 20-year period were attributed to the powerline industry, that still amounted to several hundred. Tree strikes on distribution lines are the main contributor, and vegetation management and asset hardening are among the task group’s focal areas.



PILLAR 5

BUSINESS EXCELLENCE

Business excellence has come to be seen through a much wider lens than financial metrics alone, important as they remain. From the perspective of CEA and its members, long-term corporate success, and the continued momentum of the clean energy transition, depend on several additional factors that are not explicitly captured in financial reporting.

These include meaningful investment in innovative technologies; effective engagement with regulators and business partners; and effective responses to human resource challenges, including the need to foster greater diversity in an industry where many roles remain heavily male dominated.

CEA plays an important role in enabling its members to respond to each of these imperatives, including acting as the industry's designated lead on engagement with the federal government.

Powering Canadian Leadership

In November, Prime Minister Justin Trudeau spoke at CEA's Powering Partnerships dinner, the first time a sitting Prime Minister has addressed the Association. "Ever since inventors first harnessed the power of electricity, people have known that it's the way of the future," the Prime Minister told the assembled CEA members, partners and stakeholders. "In the 1800s, they were thinking about electric lightbulbs. In 2018, we're thinking about electric cars. You're powering our tomorrow, a future where Canada is a leader in clean tech and innovation. And you're already well on your way."





Resources of the Future

[CEA endorsed the recommendations](#) from this federally convened strategy table and called for urgent action to implement them. They included fast-tracking approvals for innovation, establishing a cost-shared innovation fund, defining the percentage of utilities' investments to be dedicated to innovation, and piloting proposed new major project assessment processes.

First Flow Battery Boosts Storage Duration

TC Energy has installed Canada's first flow battery – deploying technology initially designed by NASA and which could be an effective tool in firming renewable generation. This solar plus storage project will combine bifacial panel solar technology with flow battery energy storage. While lithium-ion batteries can typically provide cost-competitive storage for up to four hours, flow batteries have much longer-duration capabilities – eight hours in the case of this five MW project near Aldersyde, Alberta. This will be an opportunity to prove the viability of flow batteries in a northern climate.

Investment in Innovation and Technology Advancement

Large proportions of CEA members deployed a range of innovative technologies, which have the potential to significantly improve environmental outcomes and customer experiences, while accelerating the clean energy transition. This was achieved despite the frequent hesitancy on the part of regulatory bodies to approve funding specifically for trials and applications of emerging technology.

To both recognize and promote innovation in the sector, CEA launched the Canadian Electricity Centre of Excellence in 2018. In part through an annual reception and showcase held just off Parliament Hill, this initiative highlights cutting-edge approaches to the production, delivery and consumption of electricity on the part of CEA members. It demonstrates just how deeply embedded innovation is within the industry’s mindset and operations.

EMPLOYMENT

| | 2015 | 2016 | 2017 | 2018 |
|-----------------------------------|--------|--------|--------|--------|
| Total FTE Positions | 68,141 | 64,869 | 65,795 | 64,914 |
| Total Employee Compensation (\$B) | \$6.98 | \$7.18 | \$7.63 | \$7.77 |

▶ **57%** OF CEA MEMBERS HAD A DOCUMENTED, PUBLICLY AVAILABLE DIVERSITY/INCLUSION POLICY IN 2018

Engagement of Regulators, Partners and Others

In late 2018, CEA provided the Prime Minister’s Office and other senior federal officials with recommendations on more than a dozen issues of vital importance to the electricity industry. This included reiteration of a long-standing concern with accumulating regulatory burdens, which risk choking off the innovation and investment needed to sustain the clean energy transition.

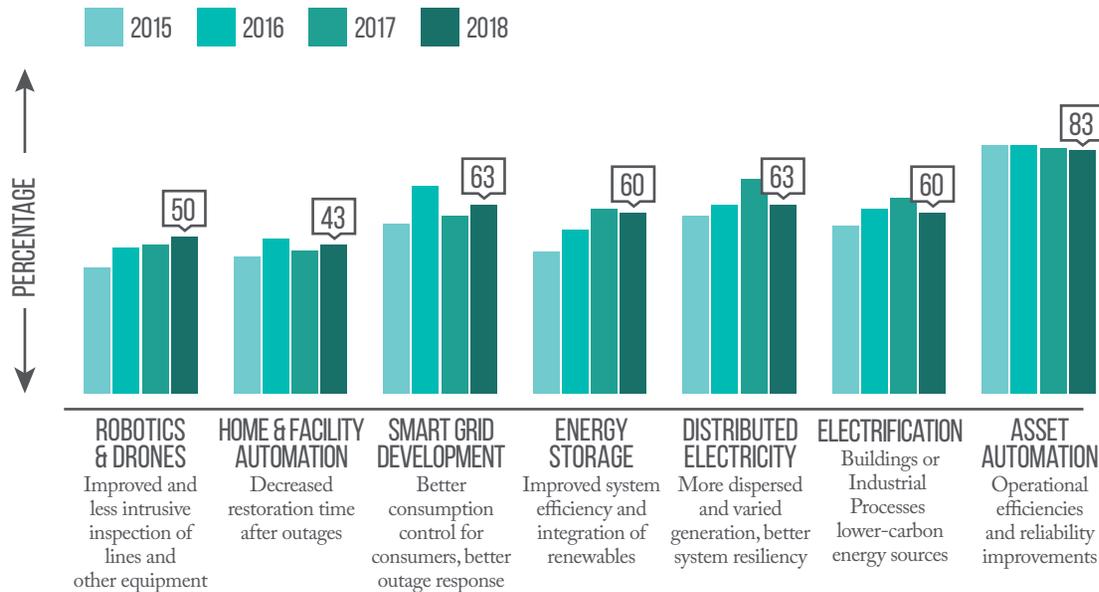
Other key imperatives addressed in the recommendations included [finalization of a Canadian Energy Strategy](#), enabling energy sector innovation and infrastructure development (with a particular focus on northern infrastructure), development of a national electrification strategy, and strengthening cyber security.

CEA continued to engage with the federal government on proposed legislative changes relating to major project assessments and to fisheries protection. While supportive of the stated intentions of these bills, CEA cautioned against unintended consequences such as increased operational uncertainty, and disincentives and delays impacting new clean energy projects.

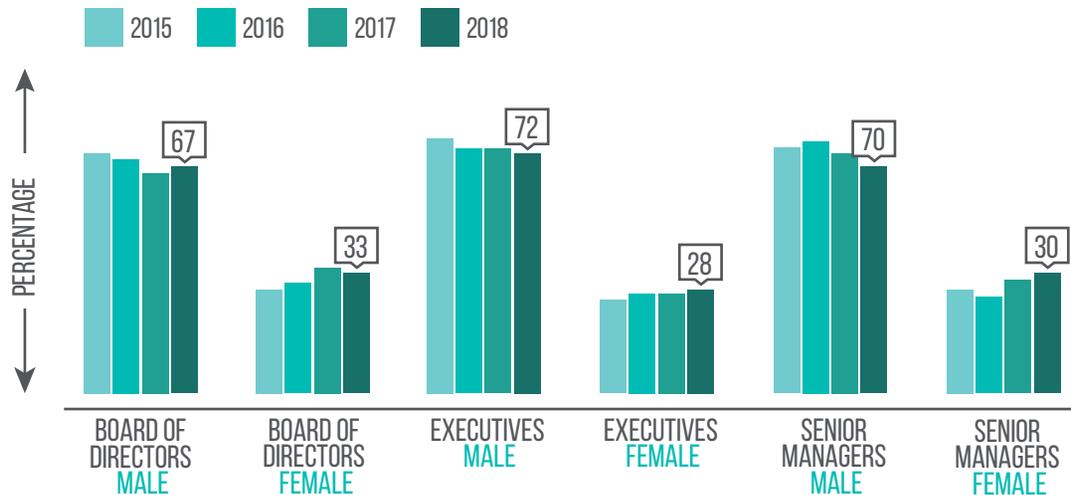
Improvements were achieved to project-assessment legislation during final-stage consideration, including reduced ministerial discretion. The full impact of both pieces of legislation – C-69 and C-68 – will, however, only emerge over the course of their implementation, with the impact of fisheries-related authorizations being one significant unknown.

CEA also engaged on various GHG reduction initiatives. This included finalization of the federal carbon pricing and trading framework, and of new regulations relating to coal and natural gas-fired generation. It also included ongoing development of a new clean fuel standard. CEA sought to guard against undue increases in natural gas costs, given its importance as a transitional fuel and enabler of renewables.

INNOVATIVE TECHNOLOGY DEPLOYMENT (% OF COMPANIES USING EACH)



DIVERSITY IN SENIOR POSITIONS



Recruitment, Training and Retention

CEA member companies seek to recruit, develop and retain well-qualified employees who are representative of the broader communities within which operations are located. Training, professional development and employee satisfaction programs are numerous and diverse.

Member company recruitment and retention initiatives in 2018 included, among others, awareness events focusing on diversity and inclusion, establishment and pursuit of defined diversity targets, and programs designed to better accommodate employment on the part of specific groups such as veterans.

Workforce diversity is an association and a sectoral priority. Female representation at the board, executive and senior management levels within member companies improved moderately in 2018 but remained at well below parity.

The CEA Human Resources Committee continued its work in 2018 to identify ways of accelerating diversity within the industry's workforce and tasked a sub-committee of member diversity and inclusion specialists with expanding the focus beyond gender representation alone.

Opportunity for Improvement:

Are we casting the net broadly enough on workforce diversity? While industry-wide performance continues to lag on gender representation in many roles, that's far from the only diversity measure. A CEA expert group broadened its focus in 2018 to address diversity and inclusion in a wider sense, and encompassing such identifiers as ethnicity, disability and sexual orientation.

Member Action to Strengthen Their Business

Reducing Outage Impacts on Customers

A newly installed outage management system at Saskatoon Light & Power (SLP) is expected to help cut both the scale and length of power outages, while also providing better performance tracking to help proactively strengthen SLP's electricity distribution network. With the benefit of predictive outage analysis, SLP is now better able to identify the probable location of faults and the extent of the resulting outages. Faster damage assessment, automated reporting, better guidance for dispatchers and field crews, and more up-to-date communication to customers are also among the benefits.

Not Just for Amazon Deliveries

It's no small effort when maintenance inspections require the installation of scaffolding – in fact, it can require days to set up and cost tens of thousands of dollars in time and materials. But ATCO has begun deploying the highly efficient alternative of a “Flyability Drone”, which can perform a visual inspection in under an hour and with no costly set up. This is allowing for more frequent inspections, earlier detection of potential issues, and better overall maintenance management. That in turn means lower-cost and safer operations.

What Gets Measured

Nalcor continued to pursue occupation-group-specific gender-equity targets that it set in 2017, as part of a broader diversity and inclusion initiative. It is closing in on a 35 per cent female representation target for management roles and saw significant progress at the executive level in 2018 as well. Female representation among engineers remains an improvement focal point. Nalcor and Newfoundland and Labrador Hydro also held an inaugural Diversity and Inclusion Day in 2018, with focal points such as unconscious bias and respectful workplaces.

Stronger Than Steel, Lighter Than Aluminum

Nanotubes are among a variety of high-value products that captured carbon may ultimately be turned into. With its recent investment in a company called C2CNT, Capital Power is contributing to nanotube-related development and testing and intends to help build the first commercial scale plant in Alberta if the technology proves successfully scalable. Carbon nanotubes are conductive, stronger than steel, lighter than aluminum, and have multiple applications as industrial materials. C2CNT is building a demonstration plant at the Alberta Carbon Conversion Technology Centre, which is hosted at the Shepard Energy Centre, which in turn is co-owned by Capital Power and ENMAX.

Small Reactors, Big Opportunity

The Government of New Brunswick and two private companies – Advanced Reactor Concepts and Moltex Energy – both announced funding in 2018 to explore the development, licensing and construction of Advanced Small Modular Reactors (SMRs). This will take place at New Brunswick Power's Point Lepreau nuclear generating station. The Advanced SMR Nuclear Energy Research Cluster will focus both on clean electricity generation – for domestic and export use – and on opportunities to commercially leverage the SMR-related technology and expertise taking shape in New Brunswick. Construction of a commercial demonstration plant, likely to attract global scientific and engineering interest, is one possible outcome.

Expanding Supply Chain Diversity

Hydro One procurement from Indigenous suppliers totaled approximately \$39.4 million in 2018, up by close to two-thirds from the previous year. A variety of efforts to build trust within Indigenous communities and businesses underpin this success. These include workshops for Indigenous suppliers – eight of which were held in 2018 – at which connections are made and businesses can register in a Hydro One database. The company also sets aside portions of some contracts for direct offer to Indigenous businesses and targets its communication of procurement opportunities. Hydro One has been named an Indigenous Procurement Champion by the Canadian Council for Aboriginal Business.



GLOSSARY OF KEY TERMS

All injury/illness rate is the number of fatalities, lost-time injuries, and medical treatment injuries per 200,000 employee-hours worked.

Carbon dioxide equivalent (CO₂eq) is a universal measure of global warming potential for greenhouse gas emissions. Carbon dioxide is used as a reference gas against which the other GHGs are measured because it has the smallest global warming potential. Global warming potential of other greenhouse gases is then expressed as a proportion of carbon dioxide's potential.

Climate [change] adaptation refers to human-initiated adjustments to natural or man-made systems, in response to actual or expected global warming or other climatic impacts or their effects, intended to mitigate harm or exploit beneficial opportunities associated with those impacts and effects.

Conventional coal refers to coal-fired electricity generation without the application of new technologies, such as carbon capture-and-storage, that create the potential for significantly reduced carbon emissions.

Lost-time injury/illness rate is the number of lost-time injuries or illnesses – i.e. those requiring time away from work – per 200,000 employee-hours worked.

Lost-time injury severity rate is the number of days lost due to injuries or illnesses – i.e. those requiring time away from work – per 200,000 hours worked.

Net generation is the total amount of electricity generated, minus the electricity used to operate the generating facility.

Non-emitting generation/sources refers to means of generating electricity that do not result in direct generation of carbon emissions; includes sources such as renewables and nuclear and hydro generation.

Paris Climate Agreement was negotiated and adopted at the 21st Conference of the Parties of the United Nations Framework Convention on Climate Change in 2015. Through nationally determined contributions, it seeks to keep the increase in global average temperature to well below 2 °C above pre-industrial levels.

Polychlorinated biphenyls (PCB) are an organic chlorine compound previously widely used for cooling and other industrial purposes. While subject to an international ban on their production, they are both toxic and long-lasting when released into the environment.

Priority emissions in the context of Canadian electricity generation include nitrogen oxide (NO_x), sulphur dioxide (SO₂) and mercury – all of which are generated through combustion, have multiple sources, and can have deleterious environmental and health impacts in sufficient concentrations.

Priority spills refers to a petroleum spill of more than 500 litres, to a spill that contains more than one gram of polychlorinated biphenyls (PCBs), and to any volume of petroleum-based or PCB-contaminated substance that enters a water body.

Rate-setting/structures refers to prescriptive regulatory processes by which government agencies – based in part on public and stakeholder input – determine the price that utilities can charge for essential commodities such as electricity.

Renewable energy refers to energy from sources that do not rely on a fuel source (such as fossil fuels) of which there is a finite supply. Primary examples include wind and solar energy. For purposes of CEA tracking and analysis, hydroelectricity is categorized separately from other renewables.

Sulphur hexafluoride (SF₆) is a colourless, odourless and non-flammable greenhouse gas with a very high global warming potential. It is used by the electricity industry as a gaseous insulator for high-voltage circuit breakers, switchgear and other equipment, often replacing PCBs.



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