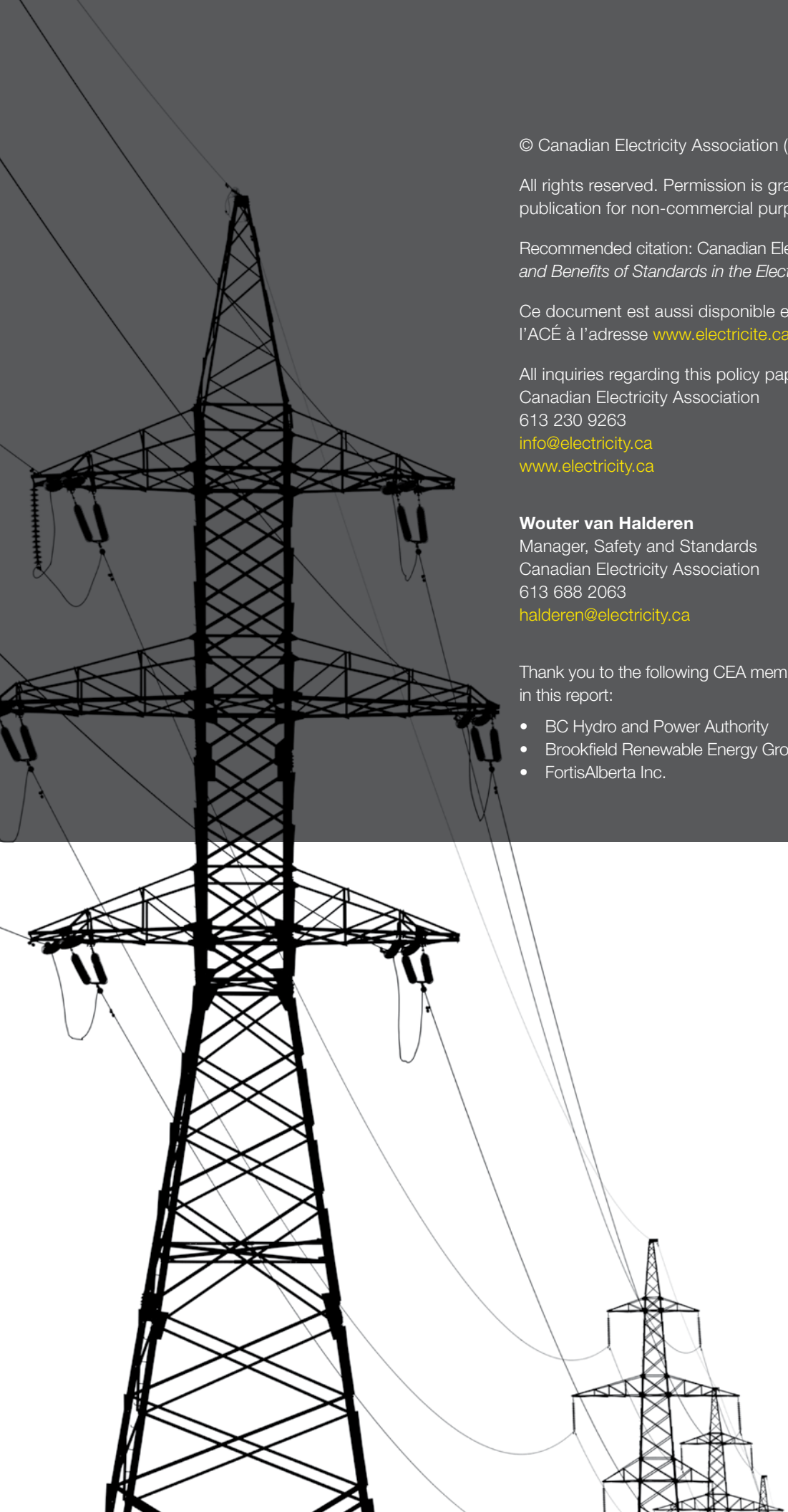
The Importance and Benefits of Standards in the Electric Utility Industry

Canadian Electricity Association | Association canadienne de l'électricité



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A Message from the CEA Standards Management Committee Chair

The CEA Standards Program, overseen by the CEA Standards Management Committee (SMC), continues to strategically manage issues and activities related to standards development and conformity assessment. Its decisions impact the electric utility industry and its customers, regionally, nationally, and internationally, while addressing and promoting the national public interest by advancing the economy, supporting sustainable development, benefiting the health and safety of workers and the public, assisting and protecting consumers, and facilitating trade.

There are many benefits to standardizing the electric utility industry. The intent of this document is to communicate the benefits and provide recommendations that can be used to drive and support Canadian electric utility standards.

CEA'S STANDARDS MANAGEMENT COMMITTEE MEMBERS

- Max Cananzi, Horizon Utilities Corporation (CEA Standards Management Committee Chair)
- Richard Delhorbe, Schneider Electric Canada Inc.
- Gary Erickson, SaskPower
- Ajay Garg, Hydro One Inc.
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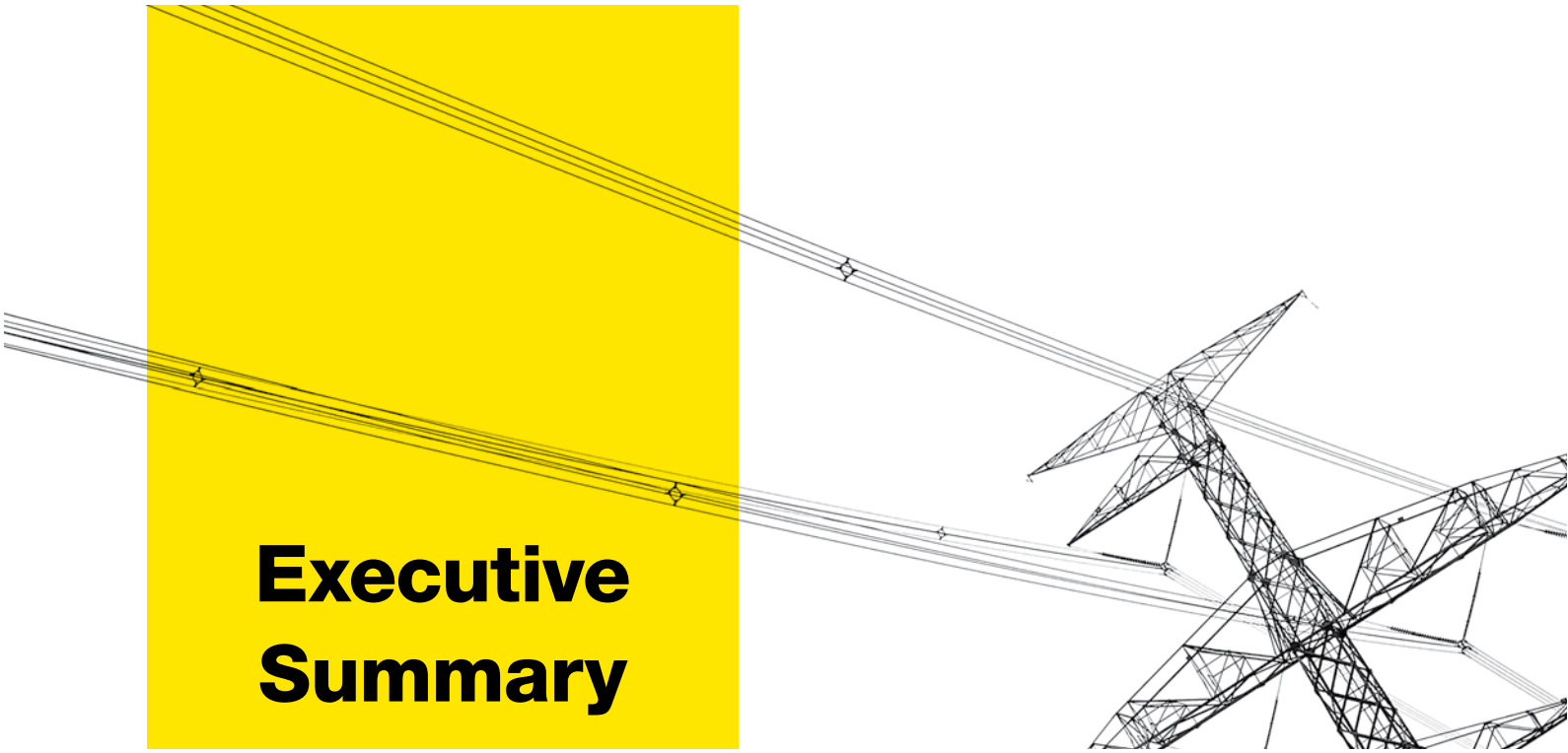


Executive Summary

CEA and its Corporate Utility members have been proponents of electric utility standards since the organization's inception in the late 1890s. The use of standards has been highly beneficial to the Canadian economy as well as to the design, construction, procurement, maintenance, and operating processes of the electricity industry. Updated standards are crucial at this point in time, as the industry prepares to enter into a multi-year intensive capital replacement program, estimated to cost $350 billion[1], to replace legacy devices with current technologies.

This paper is intended to underscore the importance of standards in the electricity sector and highlight the benefits for the electricity industry from the SMC perspective:

- **Engineering and Drafting;**
- **Electricity System Reliability and Service Quality;**
- **Electric Utilities Equipment Standardization;**
- **The Role of Standards in Utility Operations;**
- **Promotion of International Trade; and**
- **Enabling Infrastructure Replacement.**

The report then outlines a number of observations and recommendations drawn from the discussion:

- **There is an increased need for new or updated standards;**
- **There is an increased need for utilities to adopt standards;**
- **There is an increased need for Canadian participation in industry standard development teams; and**
- **There is an increased need for Canadian electric utilities to leverage their standard requirements.**

1 Conference Board of Canada, "Shedding Light on the Economic Impact of Investing in Electricity Infrastructure," February 2012.

The Importance and Benefits of Standards in the Electric Utility Industry

The Canadian Electricity Association (CEA) has been a proponent of electric utility standards since the organization's inception in 1891. Standards benefit the Canadian economy, as well as the design, construction, procurement, maintenance, and operating processes of the electricity industry. These benefits have proven crucial over the years, and are even more valuable today, with the advent of communications technology, the computerization of traditional electro-mechanic devices, and the introduction of smart grid technologies.

This paper sets out to document the benefits of standardization and to provide recommendations that can be used to drive and support the development of Canadian electric utility standards.

What is a Standard?

There are many definitions of standards And standardization. Standards are an approved set of rules intended for repeated use that aim to ensure industry or company operational consistency. Industry standards are approved by recognized standardization bodies to ensure consensus by subject matter experts.

The Role of Standards in Support of Industry Challenges and Opportunities

Canada's electricity industry currently faces a set of challenges and opportunities that accompany dynamic industry renewal. Growing competitive pressures, capacity constraints, changing customer and environmental expectations, aging infrastructure, and rapid technological changes have all become key considerations of Canadian electric utility operational strategies. In turn, this has led to a greater reliance on recognized international, national, and regional standards related to electrical system safety, reliability, compatibility, efficiency, cost-effectiveness, and performance in order to manage change and ensure due diligence.

Utility participation with standards development bodies is the most efficient way to ensure the Canadian electricity industry is not left behind as governments, vendors, and customer groups push forward ideas for electricity sector renewal. In the past, most standards were developed either to provide interoperability between two existing technologies, or as a response to a well-established technology becoming the industry norm. Now standards are increasingly driving the technologies themselves, and, in some cases, defining utility business practices.

Participants in standards development are able to positively influence market development. Standards related to the electricity industry's products and services can hasten the acceptance and implementation of new technology, promote competition, reduce trade barriers, expand current markets, and help develop new markets. Standards may be referenced in regulations or other documents, such as tenders and purchase contracts, by utilities and their customers. Thus, standards development is strategically important for all businesses in the expanding utility marketplace.

CHALLENGES

Challenges in the creation and implementation of standards in the electricity industry include:

1. Loss of technical expertise, which is causing an increase in the number of outdated standards and slowing the development of new standards;
2. Outdated standards are impeding the training of new staff;
3. The evolution of digital and smart grid technologies is outpacing the development of standards;
4. Increasing regulatory requirements are accelerating the need for standards development and compliance to industry standards;
5. Technological advancements are requiring utilities to reach 'beyond the meter,' resulting in more interactions with customers, who now expect to provide input in the process of standards creation;

About the CEA Standards Program

The CEA Standards Program, overseen by the CEA Standards Management Committee (SMC), continues to strategically manage issues and activities related to standards development and conformity assessment. Its decisions impact the electric utility industry and its customers, regionally, nationally, and internationally, while addressing and promoting the national public interest by advancing the economy, supporting sustainable development, benefiting the health and safety of workers and the public, assisting and protecting consumers, and facilitating trade. The SMC has identified a need to revisit and document these benefits.

The intent of the CEA Standards Program is to provide support for CEA's Transmission and Distribution, and Generation Councils, CEA members, and the electricity industry at large.

6. Digital communication devices are introducing new security challenges which standards have not yet captured;

7. Increasing interconnectivity between Canadian and American power grids are leading to more influence from American regulators on how Canadian utilities operate; and

8. Given rapid change in the sector globally, decision makers in government need to understand and appreciate of the value of standardization and support standards development.

OPPORTUNITIES

Standards provide opportunities for the electricity industry, for example:

1. Standards development is driving industry technological advancement, and, in some cases, defining utility business practices;

2. Participants in standards creation are able to positively influence market development. Standards related to products and services for the electricity industry can quicken the acceptance and implementation of new technology, promote competition, reduce trade barriers, expand current markets, and help develop new markets;

3. Standards may be referenced in regulations or other documents, such as tenders and purchase contracts, by utilities and their customers;

4. The ongoing wave of retirement of many industry experts provides career opportunities for new contributors;

5. The adoption of new technologies is enabling utilities to meet and provide their customers with value added services. These technologies may become the defacto standard or create the opportunity for a new standard to be developed;

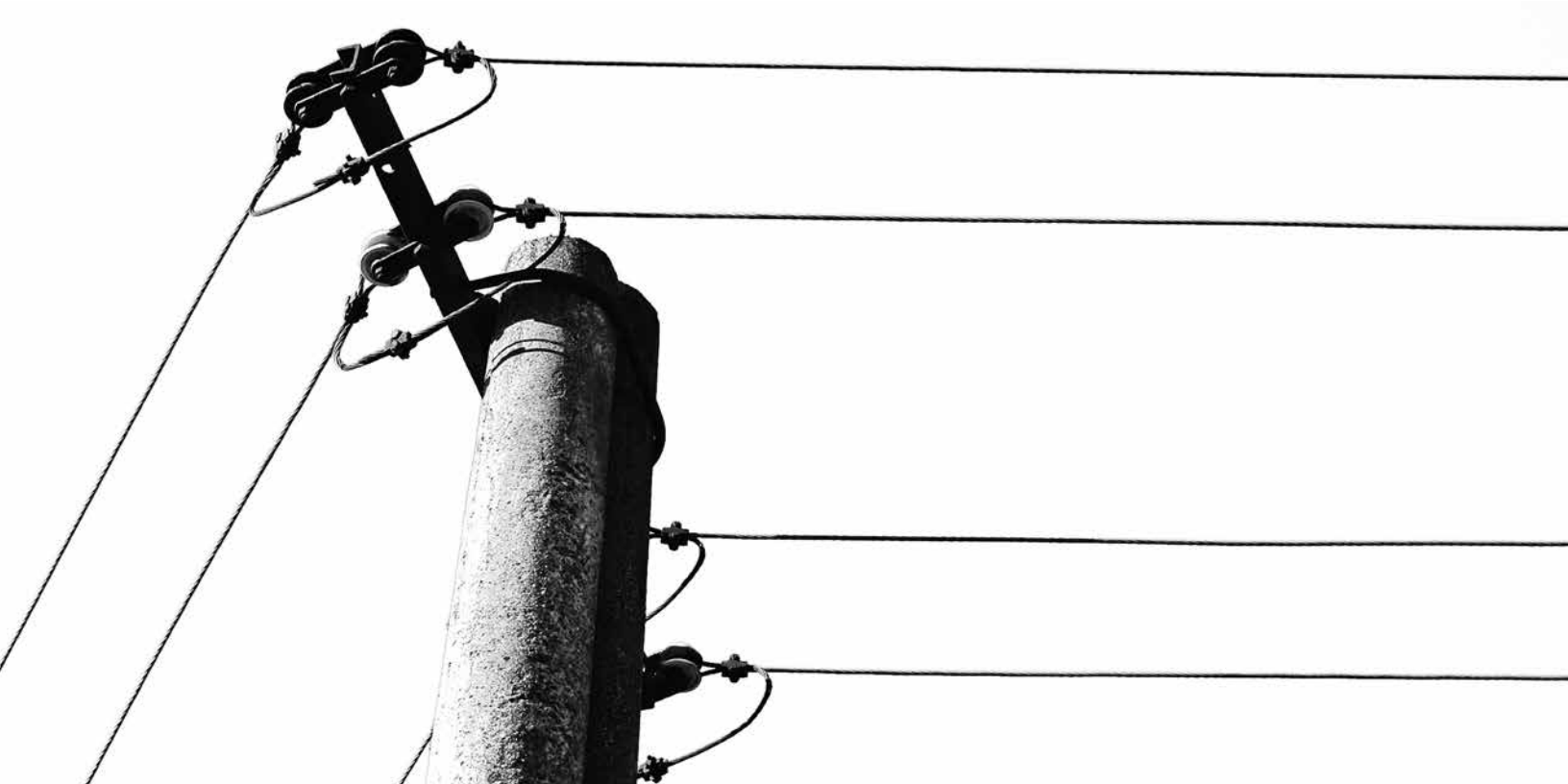
6. Standards by utilities are expediting the interoperability of tools and equipment;

7. The standardization of new technologies and processes can increase operational efficiency;

8. Standards can provide decision-makers with limits, alternatives, and general guidelines, empowering choices that are both cost-effective and consistent with accepted industry practices;

9. Standards are instrumental in ensuring safety.

10. Standards allow the industry to share knowledge, technical solutions, and best practices leading to sector-wide improvements.



Benefits of Standards in the Electric Utility Industry

Without standardization, aspects of the electricity industry might not work or interoperate as expected. Furthermore, without standards, products would not be economical for wide-scale use, and might be hazardous to operate.

Electricity industry standardization ensures consistency in accepted practices. These practices are essential for quality assurance, ecological sustainability, employee and public safety, economic responsibility, grid reliability, infrastructure compatibility, utility interoperability, energy efficiency, and overall effectiveness. When electric utility companies and governments invest in the development and application of standards, they can observe and identify a number of benefits.

Standards allow utilities to mitigate risk when adopting new technologies, as well as navigate the transition from outdated technologies. Standards codify the latest technology and facilitate its transfer. Standards are an invaluable source of knowledge: they distill expert knowledge and make it widely available. In essence, standards provide productivity tools that result in substantial cost savings to electricity industry entities, consumers, and the Canadian economy.

Utilities use the benefits derived from standards to inform many business aspects.

1.

ENGINEERING AND DRAFTING

Engineers use established standards to support their decisions. By searching for and applying relevant standards engineers can derive maximum benefits from their designs. Standards provide engineers with information regarding requirements and acceptable methods.

Standards simplify the work of engineers by:

- Reducing the amount of time spent on each application;
- Reducing the number of design variants;
- Providing consistent design approaches;
- Providing compatibility among various technical solutions; and
- Reducing the learning curve.

The use of standards results in a set of replicable and consistent designs. These designs drive the development of official drawing records. The repeated production of these designs using standard drawing templates results in production improvements and cost savings.

Value of Standards

The North American electric power operating frequency has been standardized to operate at 60 Hz. Standardization allows Canadian and American power grids we to easily interconnect, trade electricity, and operate in unison. Without standardization, today's electricity industry would not have been able to develop into such an integrated and complex provider of electric energy, which heavily influences the Canadian economy and the daily lives of Canadians.

2.

ELECTRIC SYSTEM RELIABILITY AND SERVICE QUALITY

The electric power system is one of the most critical infrastructures in North America, forming an essential component of today's digital society and quality of life. Both daily life and the economy depend on the reliable operation of the electric power system.

RELIABILITY

The 2003 blackout in northeastern North America was a catalyst for standards implementation, as it brought into focus the responses required for major blackouts. Around this time mandatory standards were implemented in the United States and adopted by many provinces in Canada to establish reliability thresholds and to improve system reliability. In May 2012, the North American Electric Reliability Corporation (NERC) published the report *2012 State of Reliability*[2]. This report represents NERC's view of ongoing bulk power system reliability trends, analyzes the state of reliability based on metric information, and provides an integrated view of reliability performance. The key findings and recommendations serve as technical input to NERC's Reliability Standards and inform project prioritization, compliance process improvement, event analysis, reliability assessment, and critical infrastructure protection[3].

SERVICE QUALITY

Electric utility machinery operates in very severe environments with high levels of electrical and electromagnetic interference. The power system also faces many other sources of interference which can compromise service quality. The most common sources include: switching operations, system faults, operation of nearby telecommunication equipment, and lightning strikes. Consequently, to ensure service quality electric components used in this type of environment are designed according to industry standards developed to prevent malfunction, electric service interruptions, injuries, and equipment failures that can lead to hazards such as fires. Examples of standards that address the hazards of fire include the National Fire Protection Association's NFPA-71[4] and NFPA-72A[5].

To ensure that the equipment connected to the electrical grid is suitable, all components manufactured and marketed in Canada must undergo quality assessments. These standards have caused a substantial decrease in failures and malfunctions, and have consequently increased the reliability of the electricity service in North America.

3.

EQUIPMENT STANDARDIZATION

Most electric utilities standardize on sets of equipment that are used for wide-scale deployment. This process typically requires the selection of new equipment or systems from submitted tenders or request for proposals.

Electric utilities typically select equipment that meet industry standard specifications, meaning that it has been deemed suitable for the electrical environment. Using standards when procuring new equipment has a number of financial benefits for a utility: it reduces the number of equipment variances, promotes negotiated advantages, and results in cost-savings for engineering, operations, and maintenance. Furthermore, equipment selection based on standardization reduces the reliance on pre-qualification testing if the product has been designed and manufactured as per accepted industry specifications.

2 North American Electric Reliability Corporation, "State of reliability," May, 2014.

3 Ibid.

4 National Fire Protection Association. "NFPA 71: Standard for the Installation, Maintenance, and Use of Signaling Systems for Central Station Service," 1989.

5 National Fire Protection Association. "NFPA 72: Standard for the Installation, Maintenance, and Use of Signaling Systems for Central Station Service," 2013.

4.

THE ROLE OF STANDARDS IN UTILITY OPERATIONS

Standards have proven to be instrumental in streamlining utility operations.

MAINTENANCE

Standards and related protocol are used to train staff and to provide guidelines for commissioning and maintaining electricity systems. Standardization facilitates the development of maintenance procedures and greatly reduces the number of different types of devices deployed, thereby reducing the number of procedures that would be required with a greater diversity of technologies.

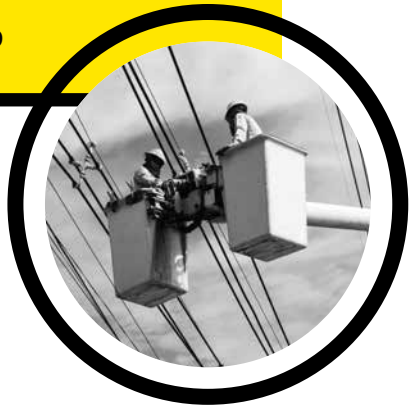
MANAGEMENT OF ASSETS

Standards allow for more efficient asset management. Standards reduce the number of variations in equipment and designs, and provide for a longer asset life-cycle. Standards and their associated documentation become records for utilities, easily referenced and retained for the life of the asset.

OCCUPATIONAL HEALTH AND SAFETY

Safety standards in the electricity industry provide guidance on common practices. These Live Working Standards are enforced to ensure the well-being of both utility employees and the public in locations where electrical supplies are installed, operated, and maintained. An example of a Live Working Standard is CAN/ULC-S801-14 (Standard on Electric Utility Workplace Electrical Safety for Generation, Transmission, and Distribution).[6] Specialized safety standards, such as S801, are written by utilities for their own use in collaboration with a standards group. This ensures the standards incorporate the unique requirements of electric utilities. The content is vetted through various utility professionals in order to provide a consistent approach nationwide. The result are standards that mitigate injury, as shown by CEA benchmarking data from 2013 (seen in the chart below).

1.73 2013 ALL INJURY/ILLNESS FREQUENCY RATE (INJURIES PER 200,000 HOURS)	↓ **19.55%** IMPROVEMENT SINCE **2009**
0.73 2013 LOST TIME INJURY FREQUENCY RATE (LOST TIME INJURIES PER 200,000 HOURS)	↓ **7.37%** IMPROVEMENT SINCE **2009**



6 ULC Standards. "CAN/ULC-S801-10, Standard on Electric Utility Workplace Electrical Safety for Generation, Transmission, and Distribution," 2010.

5.
PROMOTION OF INTERNATIONAL TRADE

International electricity trade has flourished as a result of the harmonization and adoption of key industry standards. In North America, the standardization of the basic principles of electricity measurement, such as voltage and frequency, has permitted the trade of electricity across provincial, state, and national borders via transmission lines. The use of reliability standards and product standard compliance allows for the continuation of efficient power transfer and the establishment of a power trade market.

6.
ENABLING INFRASTRUCTURE DEVELOPMENT AND REPLACEMENT

Many of the older utility standards were written during periods of industry growth. As a result, the standards focus on requirements for new construction. The present challenges, related to infrastructure refurbishment and upgrades, could not have been envisioned at the time these standards were developed. Consequently, many standards are in need of updating and modification to maintain their relevance in today's industry environment where utilities are expected to extract more value from existing resources. Electric utilities in the 21st century are faced with more large capital programs to replace aging and failing equipment than ever before. Standards can help the sector to develop these programs in a way that maximizes opportunities and mitigates challenges.

New technologies are increasingly available, causing a shift in the processes for deployment and operation of electric power system assets. The availability and adoption of industry standards play an important role in permitting the electricity industry to be nimble enough to meet these challenges. Industry standards provide efficiency improvements, drive down costs, and expedite transformations.

Ongoing Commitment to Standards Development

Participation in standards development is essential to ensure the Canadian electricity industry continues to remain reliable and respond to sector challenges. CEA and its Corporate Utility Members must be proactive in standards development.

1.

THERE IS AN INCREASED NEED FOR NEW OR UPDATED STANDARDS

- The need for standards to help the electric utility industry meet challenges has never been stronger than it is today.
- Many experienced utility employees are retiring, and it will take time for new engineers to acquire the same level of expertise as their predecessors. The availability of up-to-date industry standards will facilitate and expedite the transfer of such knowledge.
- Out of necessity, utilities have embraced new microprocessors, digital technology, and communications technologies, which have revolutionized the electricity industry. Despite demand on the part of electric utilities, standards development has not kept pace with the large-scale sector changes. Moreover, the rate of technological change and the need for associated standards continues to increase.

2.

THERE IS AN INCREASED NEED FOR UTILITIES TO ADOPT STANDARDS

- Electric utilities are being encouraged by regulators to implement renewable energy technologies, introduce efficiencies, and adopt industry standards.
- It is a good business practice for utilities to adopt industry standards as it maximizes compatibility while streamlining operation efficiencies.
- An increasing number of standards are being quoted in regulations with which utilities must comply, particularly in the area of Occupational Health and Safety.

3.

THERE IS AN INCREASED NEED FOR CANADIAN PARTICIPATION IN INTERNATIONAL STANDARD DEVELOPMENT TEAMS

- Many standards that impact Canadian electric utilities are developed by international standards development bodies and need to be harmonized for the local market.
- The development of international standards can have applications and implications for the Canadian electricity industry. Canadian representatives should be at the table during the development of these international standards.
- Participating in the development of international standards provides the Canadian sector with perspective of requirements, knowledge, challenges, and solutions, outside of our own jurisdiction.

4.

THERE IS AN INCREASED NEED FOR CANADIAN ELECTRIC UTILITIES TO LEVERAGE THEIR STANDARD REQUIREMENTS

- All Canadian electric utilities must come together as an industry to develop standards that allow the industry to adapt to the changing electricity landscape.
- Canadian electric utilities benefit from a consolidating their efforts, rather than working as individual organizations.
- Canadian electric utilities are all faced with similar challenges in design, operation, and maintenance, therefore a set of common standards can benefit all electric utilities.
- Existing North American and global electricity industry standards, for which Canada does not presently have variations of, should be adapted to suit the Canadian.

5.

THERE IS AN INCREASED NEED FOR CANADIAN GOVERNMENT LEADERSHIP TO ENSURE THAT STANDARDS DEVELOPMENT IS A PUBLIC POLICY PRIORITY

- Canadian federal and provincial decision makers must have an understanding and appreciation of the value of standards.
- At the federal level, support for national leadership and coordination of these activities, through robust funding for the Standards Council of Canada (SCC), is critical.
- Ongoing financial support from the SCC for electric utility participation in international standards development is vital to ensuring that the sector has a strong voice on the international stage.

“Through actively participating in the development of standards, the electricity industry is poised to streamline best practices, quickly adapt and implement new technologies, and better meet the needs of customers.”

The Honourable Sergio Marchi
President and Chief Executive Officer
Canadian Electricity Association

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