



Low Voltage Direct Current (LVDC) Setting International System Standards



ELECTRO·FEDERATION
C A N A D A

Electro-Federation Canada

Agenda

- What is EFC?
- What's the challenge/opportunity we need to plan for?
- Trade Impact Analysis - Case Study
- North American Standards Model inefficient
- International Standards and Compliance
- US National Standards System
- Canadian National Standards Systems
- Key Take-aways



What is EFC?

- **Champions the needs of the Canadian Electrical Sector**
 - **Manufacturers, Manufacturer Reps, Whole Distributors**
 - **US equivalent: NEMA, NEMRA, NEAD**
- **National not-for-profit association representing over 330 members contributing over \$50 billion to the Canadian economy and employing over 40,000 workers**



Key Offerings

- Issues Management
- **Codes & Standards Regulation**
- Government Relations
- Statistical Market Research
- Marketing & Communications
- Networking
- Workforce Development



Vision Statement

Electro-Federation Canada is the Canadian Association moving the Electrical & Electronics markets forward.

Electro-Federation Canada (EFC) is a national, not-for-profit industry association, representing over 250 companies that manufacture, distribute, and service electrical and electronics products in Canada, contributing over \$138 to the Canadian economy and employing more than 49,000 workers in more than 1,200 facilities across the country.

EFC provides a powerful nucleus around which the Canadian electrical and electronics markets gain competitiveness in the global market through representation on issues and opportunities impacting electro-technical businesses.

Key Market Issues & Opportunities:

- Anti-Counterfeiting & Unsafe Products
- Challenging Economic Conditions
- Electrical Safety
- Energy Efficiency
- Extended Producer Responsibility
- Intellectual Property
- Smart Energy Solutions
- Sustainability
- Trade Policy & Agreements
- Workforce and Talent Development

EFC's Value-added Services to Members:

- Advocacy on industry-related issues with all levels of government
- Education and training programs
- EFC Sponsorship and EFC Scholarship
- Engagement in Product Sections
- Industry Marketing & Communications updates
- Industry representation on codes and standards
- Networking event opportunities
- Statistical market research and analysis programs
- Timely updates on emerging issues, industry news and association activities

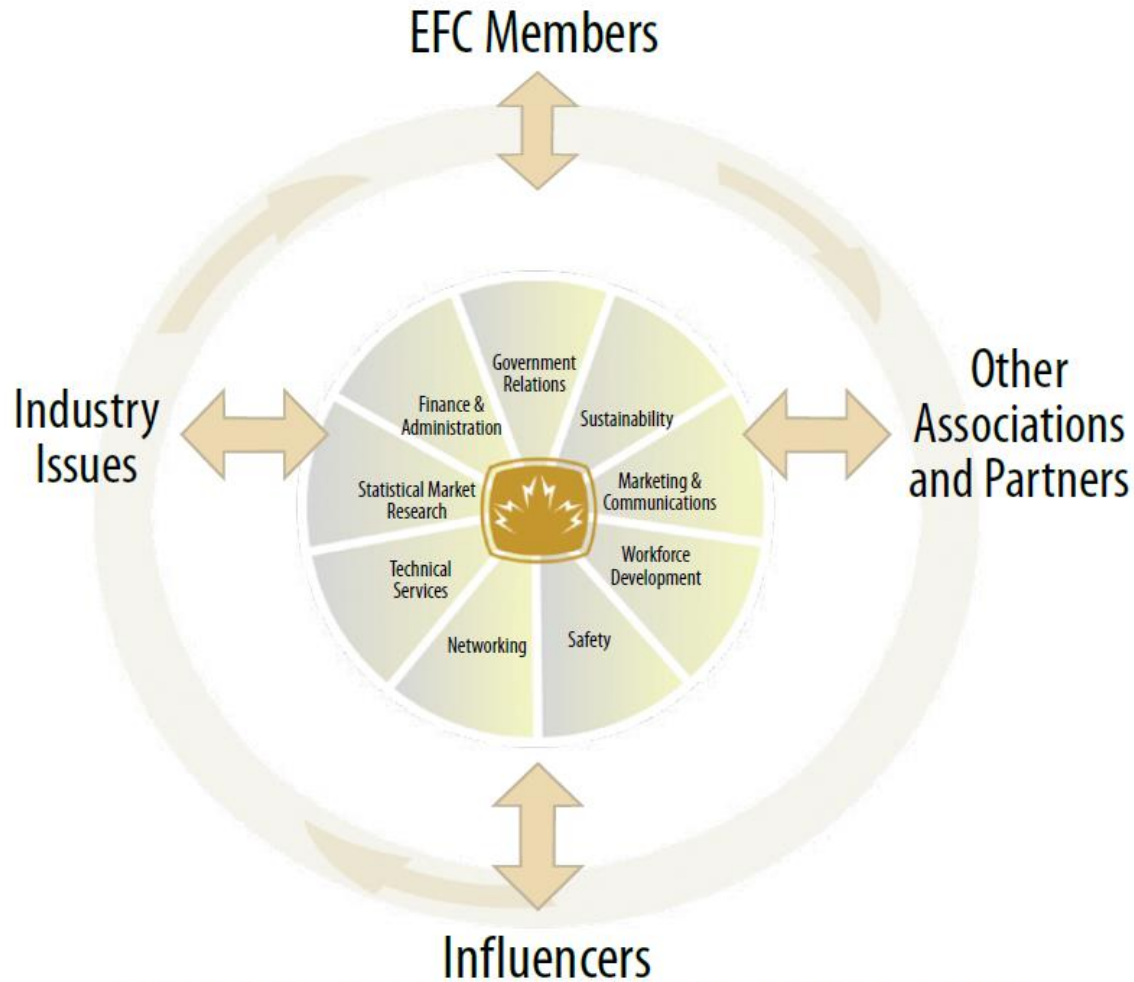
To learn more about Electro-Federation Canada and how we can help your business, visit www.electrofed.com.

Contact us at info@electrofed.com or visit the EFC website to join the EFC LinkedIn Group.

See reverse for EFC Directive and Services diagram



Electro-Federation Canada is the Canadian Association moving the Electrical & Electronics markets forward.



Government • Regulators/Inspectors • Consumers/End Users/Contractors • Consultants/Specifiers



40,302 Employees
work at EFC member companies
across Canada



IN...

1,235 Locations
across Canada

...OF WHICH...

73% are from
Manufacturing

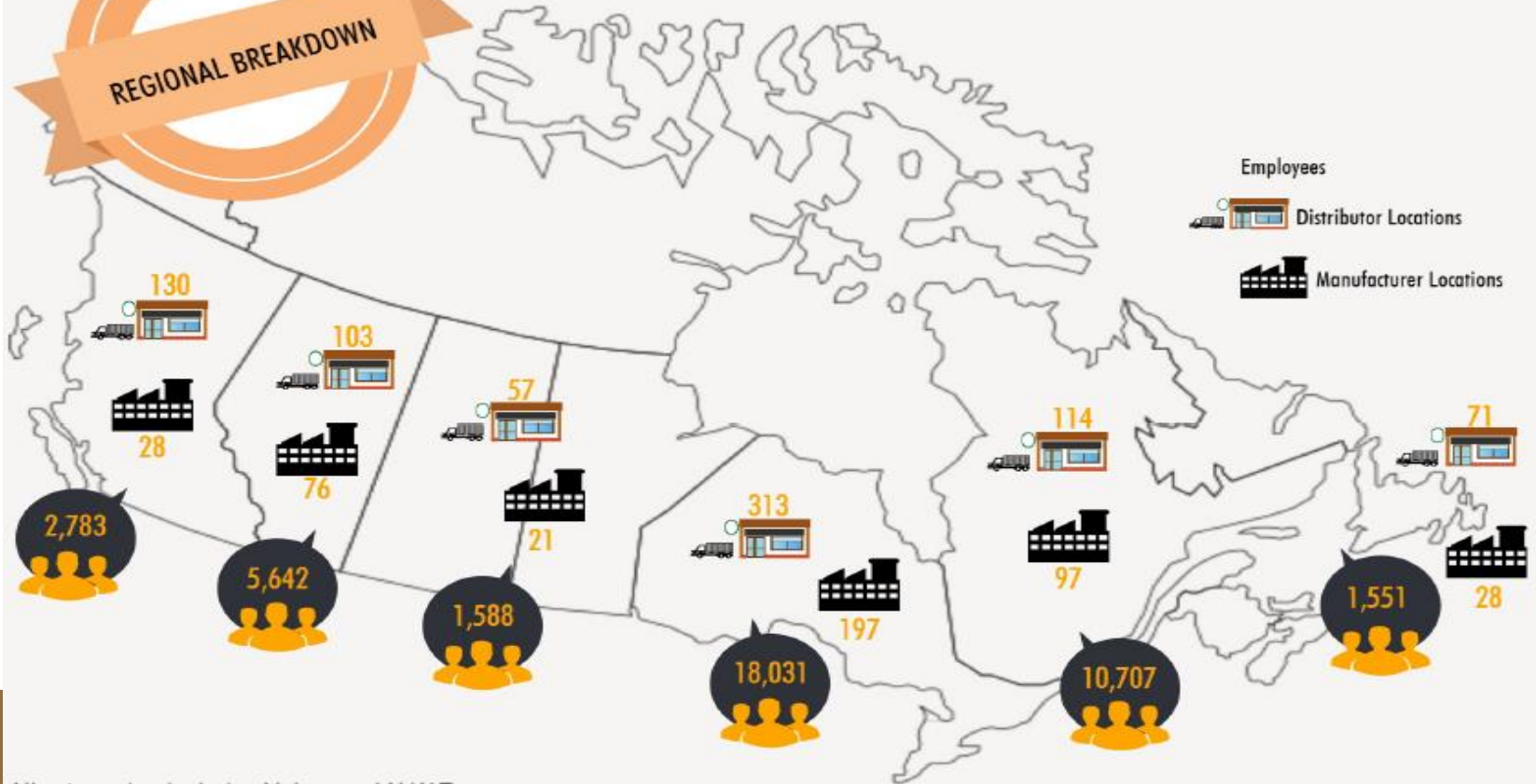
27% are from
Distribution

447
are Manufacturer
Locations

788 are Distributor
Locations

174
are Manufacturing
Plants

REGIONAL BREAKDOWN



Employees
Distributor Locations
Manufacturer Locations

Alberta region includes Yukon and N.W.T.

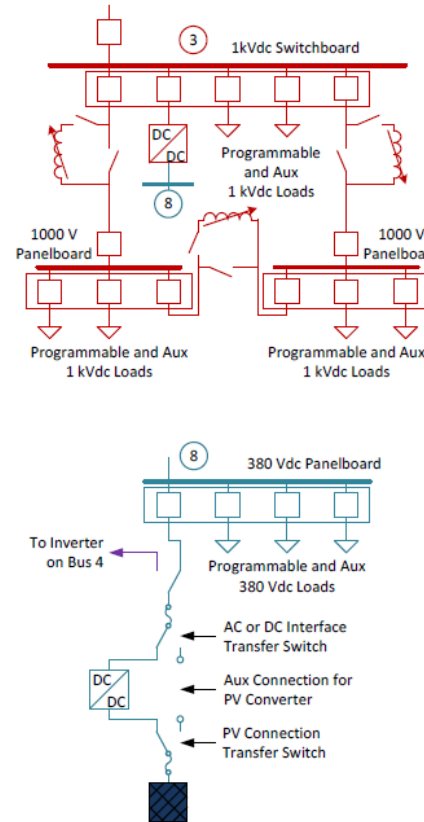
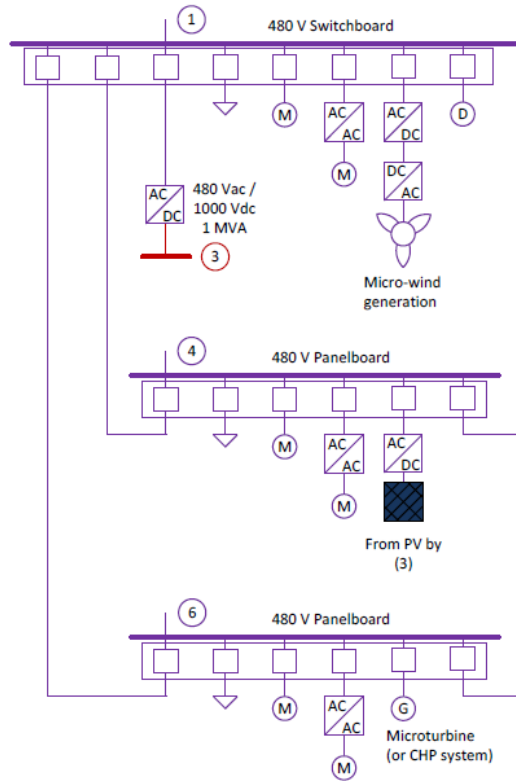
The above data represents current EFC members only, and does not include an estimate for the non-member portion of the market.



What's the challenge / opportunity we need to plan for?



Electrical One-Line Diagram (LV)



- Load Types:**
- Programmable Loads
 - Battery Storage
 - Motors & Drives
 - Load banks
 - Small Wind Turbines

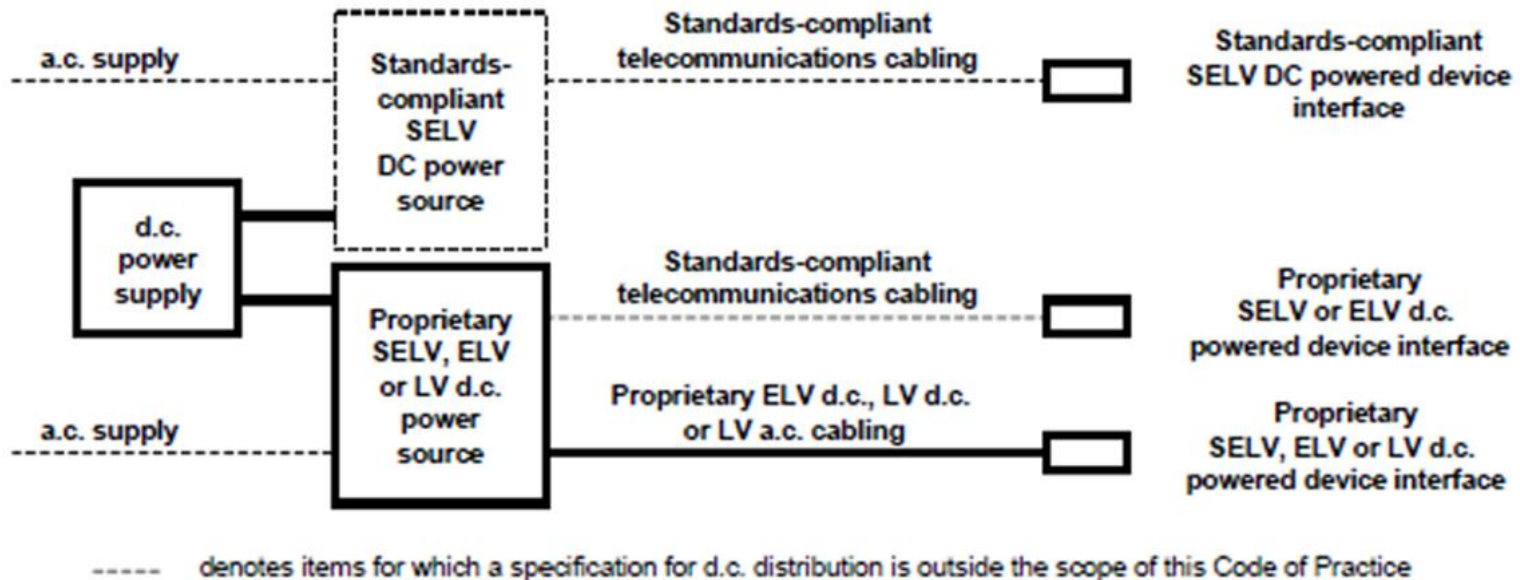
- Load Types:**
- Programmable Loads
 - Battery Storage
 - Motors & Drives
 - Lighting
 - Load Banks
 - Small Wind Turbines
 - 24V and 48V DC Buses

LV AC BUSES
LV DC BUSES



Code of Practice: L/E/SE-VDC PWR Distribution

- <http://www.theiet.org/> Product Code: PSDC001P



NOTE: All equipment (including power sources, wiring systems, protection and control devices) incorporated in work covered by the scope of this document - whether newly provided or adopted from previous use - is to be selected, erected, inspected and tested in accordance with the requirements of BS 7671

Figure 1: Schematic showing items within the scope of this Code of Practice



Trade Impact Analysis

- *Canada 'electrical' Import/Export: \$76.6B*
 - *\$29.6B or 48.1% is CA/US reciprocal trade (2012)*
- **US/CA Regulatory Cooperation Council (RCC)**
 - Electrical safety is a Prov./State alignment issue
 - EFC study conducted & case study submitted
 - Limited to US/CA comparison



Main issues identified

- Insufficient or no coordination when considering Fed-Fed / Prov-State regulations where related policy changes impacts product;
 - design, test, certification, timing or market access
- The ‘electrical’ product standards between our countries mostly different (*only 16-27% harmonized*)
 - Standard Developers see each other as competitors
 - Little incentive for SDO to harmonize effort
 - CANENA (23 years) & other Bi-national results:
 - only 140-150 harmonized



Comparison of US-UL & CA-CSA Standards

US/CA Standard Groupings	US-UL	CA-CSA
Total Standards	889 ⁵	507
UL / CSA harmonized (according to their respective websites)	155 ⁶ 7	137 ⁸
Percentage Harmonized	17%	27%
Estimated Relevant standards to our Sector based upon review of the standard titles listed on the UL and CSA websites	239	299
Other related and useful information		
Total Outlines of Investigation, Other Certification Documents and Technical Information Letters (TIL)	318	? ⁹
Total Standards plus UL Outlines of Investigation ¹⁰ and CSA-TIL	889+318=1207	507 + ? ¹¹
US/CA Electrical Codes	US-NEC Referenced Product Standards	CA-CEC Referenced Product Standards
(US) National Electrical Code - NEC (buildings)	201	-
(CA) CEC Part 1 (buildings)	-	539



Sources of added '*systems*' cost

- Manufacturers populating 2 or more standards committees for same product (US {STP&TAG}, CA, MX)
 - having to design to 2 or more standards
 - having to test/certify to 2 or more standards
 - unnecessarily applying two certification Marks
- Cost of SDO and TO/CO accreditation in both countries (SCC and ANSI)
- Lack of recognition for equivalent standards and certification [component & end-product]
- **25-40%** average redundant Stds & certification cost
 - **Conservative estimate > \$500M unnecessary cost annually** just for electrical safety



Regulatory Topics for Electrical Manufacturers must Consider

- **Product related health and safety**
- High Frequency Electro Magnetic Compatibility (EMC) emissions
- Codes: electrical safety, product & building energy efficiency
- Coordinating US/CA Regulatory implementation timeliness,
- Extended Producer Responsibility (EPR)
- Product and installation inspection & enforcement rules
- Ineffective rules to deal with counterfeit and grey market products that do not meet applicable standards



Once a Century Opportunity

- International development for AC: IEC 1906
- So why aren't global standards harmonized?
 - Majority GDP was domestic, not technology based
 - Electrical infrastructure immature
 - Fewer global players
- Direct Current viable alternative now
 - Growth will be held back until
 - Infrastructure architecture must be established
 - Then product designs can begin (hybrid ac/dc options)
 - Harmonizing now eliminates added cost from added skews



North American Standards

Current Country Based Model

Need blended 'System' Model
for US/CA standardization



Existing NA Harmonization Model

- No coherent North American approach
- CANENA
 - USA, Canada, Mexico
 - Inefficient: SDO still competing
- National SDO MoU – case by case

Competing Model - Europe ↔ IEC

- CENELEC –Dresden Agreement

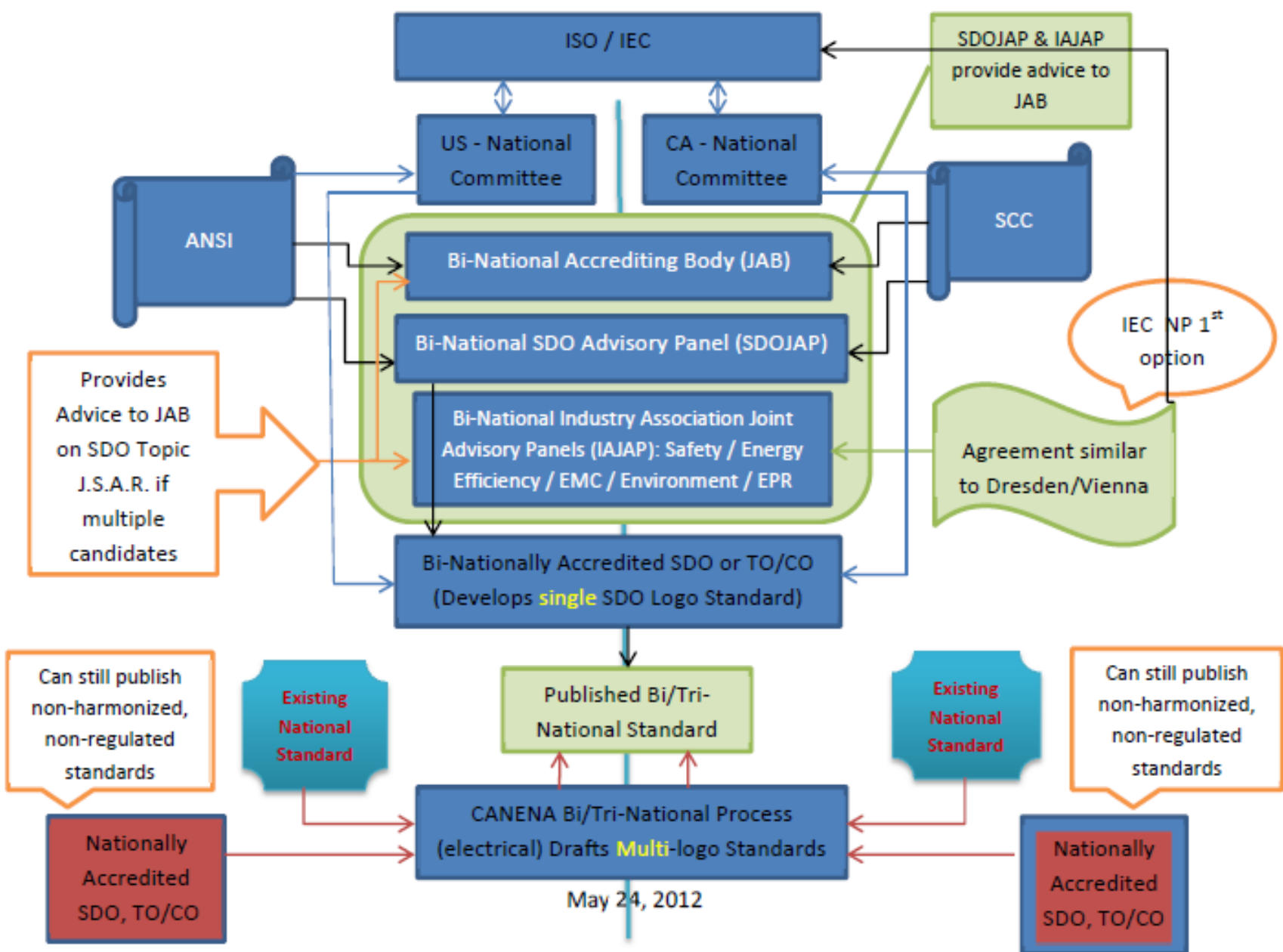


Objective for Effective Change

Streamline all relevant processes by:

- Keep what works - change what doesn't
 - Identify obstacles in current processes
 - Develop/Adopt international standards first!
 - Create more effective NA process model when different
 - Provide suitable means to effectively mitigate both existing and new models, and practices
- The new model must provide a level playing field for players in both countries
 - Accreditations (AB) for: SDO, TO, CO



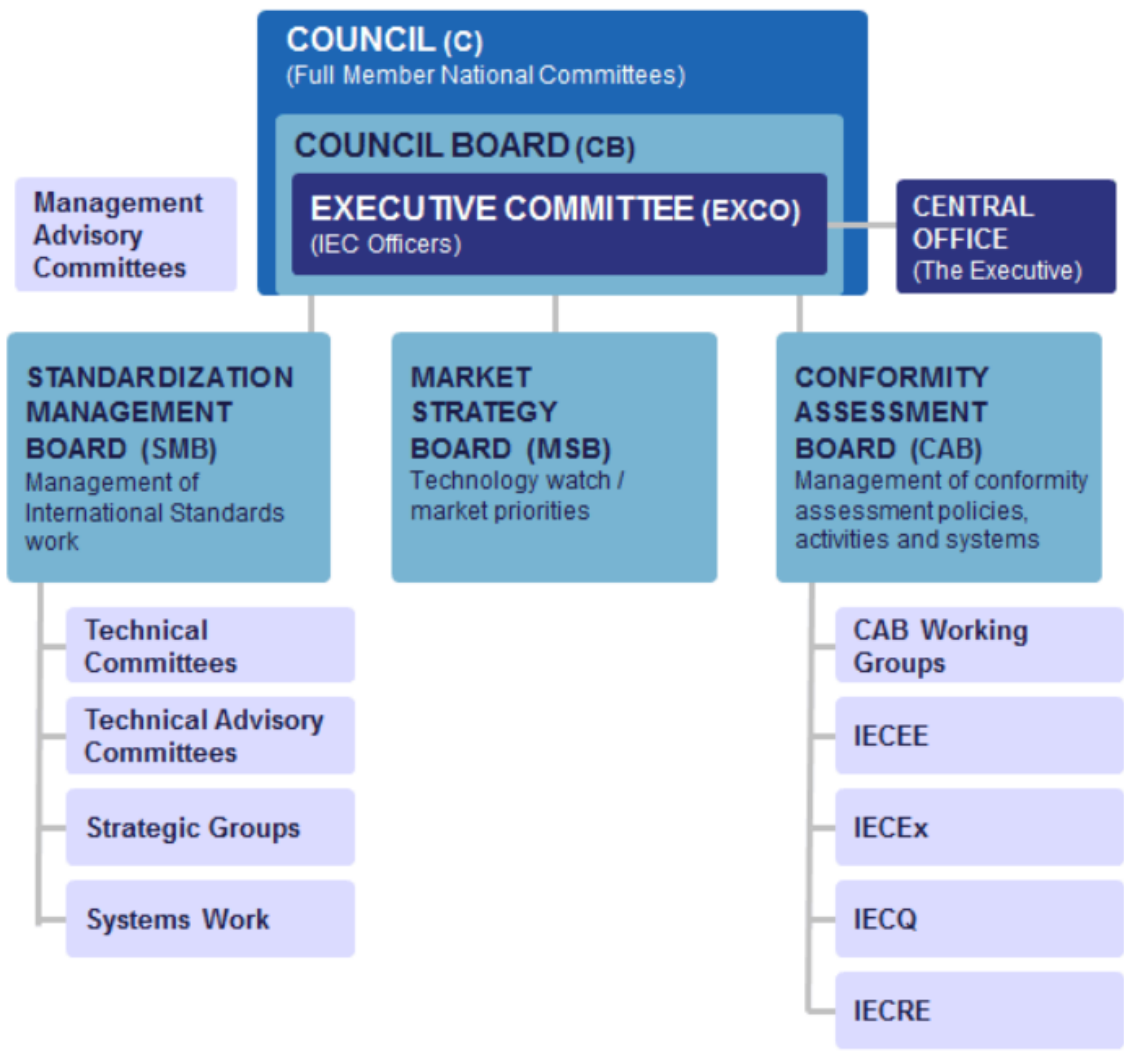


North American SDO Consortium

- Advantages

- Provides option where IEC (IEEE) not best choice
- Avoids competing interests of Standards Developers
 - Don't need competing draft documents to start process
- Quicker development
 - One harmonized process accepted in US, CA, MX(?)
- Eliminates conformity assessment duplication
- Take new Technology Leadership internationally





SEG 1	Systems Evaluation Group - Smart Cities
SEG 4	Systems Evaluation Group - Low Voltage Direct Current Applications, Distribution and Safety for use in Developed and Developing Economies
SEG 6	Systems Evaluation Group - Non-conventional Distribution Networks / Microgrids
SMB	Standardization Management Board
SyC AAL	Active Assisted Living
SyC Smart Energy	Smart Energy



Systems Committee

SyC Smart Energy

- Standardization in the field of Smart Energy in order to provide systems level standardization, coordination and guidance in the areas of Smart Grid and Smart Energy, including interaction in the areas of Heat and Gas.
- To widely consult within the IEC community and the broader stakeholder community to provide overall systems level value, support and guidance to the TCs and other standard development groups, both inside and outside the IEC.
- To liaise and cooperate with the SEG Smart Cities and future SEGs, as well as the future Systems Resource Group.



- **Systems Evaluation Group (SEG 4)**
 - **Low Voltage Direct Current (LVDC)** Applications, Distribution and Safety for use in Developed and Developing Economies
- **Purpose:**
 - Evaluate standardization status for low voltage direct current applications and products
 - Recommend to SMB the architecture of any future standardization work program that the IEC may undertake.



- **Engage** with relevant stakeholders already working in the field of LVDC
 - 2 year mandate ending October 2016
- **Objective:**
 - enhance energy efficiency
 - develop new ways to utilize LVDC power
- **Evaluate:**
 - LVDE usage in different integration environments in both developed and developing economies
 - existing LVDC market products and applications
 - evaluate / define LVDC voltage parameters



- **Evaluate:**
 - LVDE safety status and standardization means
 - gaps in standardization by using a use case mapping tool
 - advantages and disadvantages LVDE usage
 - energy efficiency, regulation, and transmission...
- **Review** the inventory of existing standards and standardization projects inside and outside IEC
- **Work** closely with SEG 6
 - Non-traditional Distribution Networks / Microgrids



- **Project** future market for LVDC products and applications
 - using information from current studies and simulation models
- **Define:**
 - use cases for the integration of DC infrastructure in the different areas
 - Residential, commercial, public, industrial, premises, Renewable Energy, E-Mobility
 - a structure for the coordination of cross TC/SC work in IEC, where required
 - Monitor to avoid overlapping work



Deliverables

- **Recommend** technical work to define the LVDC network and grid
- **Provide** the SMB with its recommendations on an approach to standardization in this area

<http://iecetech.org/issue/2015-06/DC-takes-the-driving-seat>





- DC Microgrid Development
 - Reconfigurable 1 kVDC microgrid
 - Connection points for 380 VDC homes on distributed grid network
 - Interconnection of distributed energy resources (PV, wind, microturbines, etc.)
- DC Home Development
 - DC busses at **380 VDC**, **48 VDC**, and 24 VDC for complete home voltage profile
 - Programmable and real DC loads to provide accurate representation of homes
 - Demonstration of AC vs. DC home design, efficiency, and safety
 - Can be interconnected to either AC or DC distribution networks to demonstrate near and long term objectives



- **Hosting Location:**

- Toronto at **CISCO**, WaterPark Place III
 - 88 Queens Quay, Suite 2900

- **When:**

- May 24-25, 2016

- **Planning Committee**

- Hosting logistics
- Arrange to demonstrate Canadian / North America LVDC capabilities
- Sponsorship funding

USA and Canadian Standards System



United States National Committee (USNC)/ International Electrotechnical Commission (IEC)



What is the USNC?

- United States National Committee
 - Official U.S. member to the IEC and related regional standardization bodies
- Represents the interests of the U.S. eletrotechnical industry before its international counterparts in the standardization arena
- Committee of the American National Standards Institute (ANSI)





USNC STRUCTURE

USNC/IEC Organization Structure



USNC Sponsoring Members

ABB Inc.

Agilent Technologies

Apple

Corning Incorporated

Dell Inc.

Eaton Corporation

ECC Corporation

Emerson Electric

FM Approvals

General Electric

Hubbell Inc.

Intertek

Itron, Inc.

**National Electrical Manufacturers
Association (NEMA)**

**National Institute of Standards and
Technology (NIST)**

Legrand/Pass & Seymour

Philips

Qualcomm

Rockwell Automation

Schneider Electric

Siemens Industry Inc.

Sony Electronics

Telecommunications Industries Association

Underwriters Laboratories

U.S. Coast Guard

U.S. Department of Defense

U.S. Food and Drug Administration



Membership USNC Council

Industry / Companies

Corning Incorporated

Dell Inc.

Eaton Corporation

FM Approvals

Hubbell Inc.

Intertek

Legrand/Pass & Seymour (NEMA)

Philips

Qualcomm, Inc.

Rockwell Automation

Schneider Electric North America

Siemens Industry Inc.

Sony Electronics Inc.

SignaKey (ECC Corp)

Thomas & Betts (NEMA)

Underwriters Laboratories

Organizations

Association for the Advancement of Medical Instrumentation (AAMI)

CSA Standards

Consumer Electronics Association (CEA)

ECC Corporation

Institute of Electrical and Electronic Engineers (IEEE)

Electronic Components Industry Association (ECIA)

National Electrical Manufacturers Association (NEMA)

National Fire Protection Association (NFPA)

Telecommunications Industries Association (TIA)

Government

National Institute of Standards and Technology

U.S. Department of Defense

U.S. Food and Drug Administration

Other

Consumer Advocate





Standards Council of Canada
Conseil canadien des normes

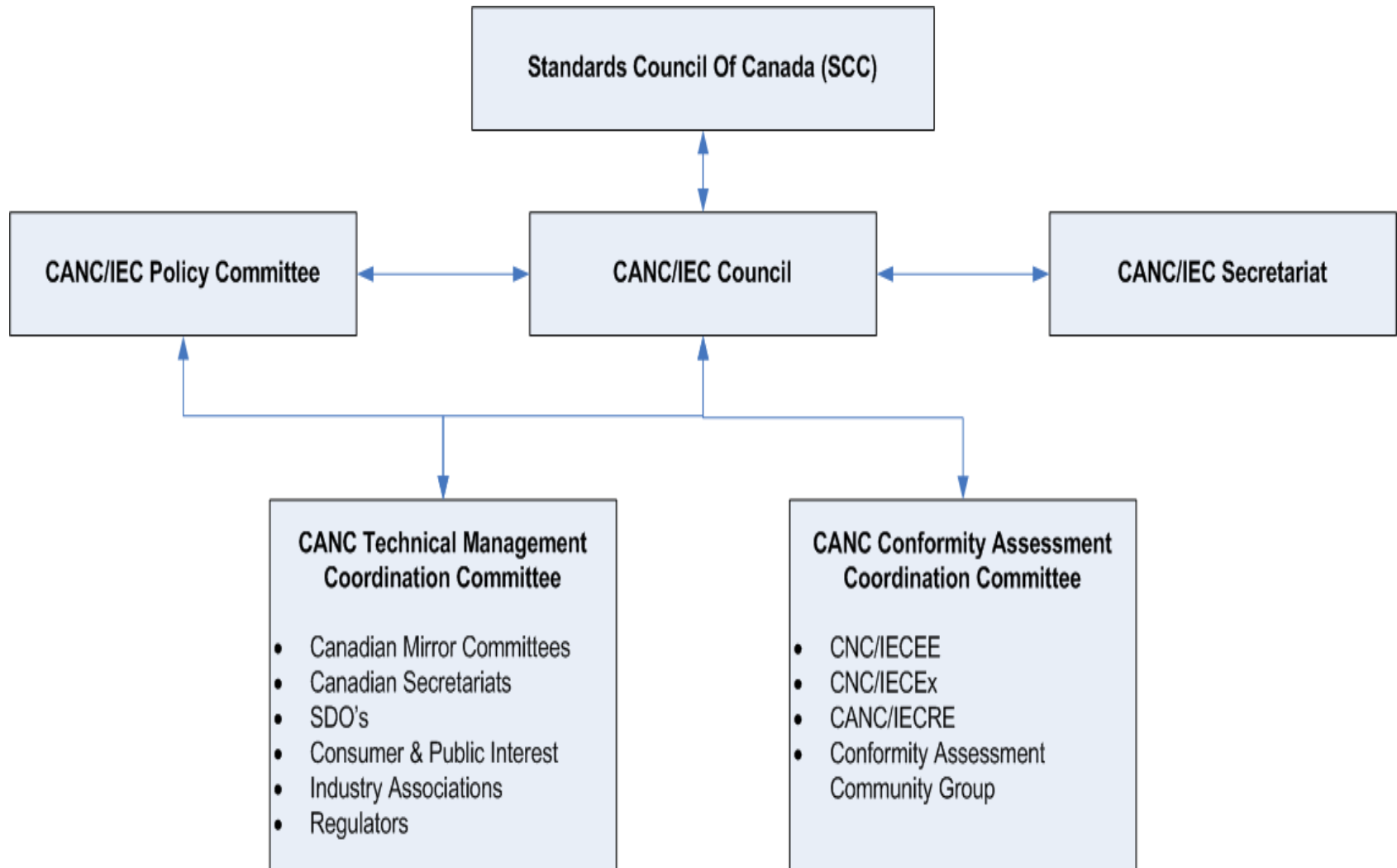
Canada

Canadian National Committee of the IEC (CANC/IEC)



Electro-Federation Canada

CANC/IEC Structure



IEEE Standards Association

- P1818 - IEEE Draft Guide for the Design of Low Voltage Auxiliary Systems for Electric Power Substations
- P946 - Recommended Practice for the Design of DC Power Systems for Stationary Applications



Key Take-aways

- International Standards – Get involved
 - Conformity Assessment – IECCE scheme
- Promote development of harmonized & Efficient North American Standards process
 - Promotes products quicker to market
 - Optimizes market investment



PRODUCT SAFETY WORKFORCE DEVELOPMENT NETWORKING
ISSUES MANAGEMENT COMMUNICATIONS
ISSUES MANAGEMENT GOVERNMENT RELATIONS
PRODUCT SAFETY NETWORKING SUSTAINABILITY
TRAINING & EDUCATION SUSTAINABILITY GOVERNMENT
COMMUNICATIONS ISSUES MANAGEMENT
ISSUES MANAGEMENT NETWORKING SUSTAINABILITY

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