

Reliability Standards in the North American Electric System

David Kiguel

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Outline

- **The North American Electric Reliability Council (NERC) and its role in the electric industry**
- **Historical Background**
- **Evolution of NERC to become the North American Electric Reliability Organization**
- **Enforceability of NERC Standards in Canada**
- **NERC Functional Model and NERC Standards**
- **Bulk Electric System (BES) versus Bulk Power System (BPS)**
- **NERC Standards Process**
- **NPCC role and NPCC documents**



NERC's Mission

To ensure that the Bulk Electric System (BES) in North America is reliable, adequate and secure



NERC's Purview

- **Bulk Electric System (NERC)**

As defined by the **Regional Reliability Organization**, the electrical generation resources, transmission lines, interconnections with neighbouring systems, and associated equipment, **generally operated at voltages of 100 kV or higher**. Radial transmission facilities serving only load with one transmission source are generally not included in this definition.



NERC – Historical Background

- Created in 1968 in reaction to 1965 Blackout
- Mission: to ensure that the Bulk Electric System in North America is reliable, adequate and secure.
- Voluntary Organization
- Establishes North American Reliability Standards
- Organized in 8 Regions (formerly 10):

Texas (ERCOT)

Florida (FRCC)

Midwest (MRO)

North East (NPCC)

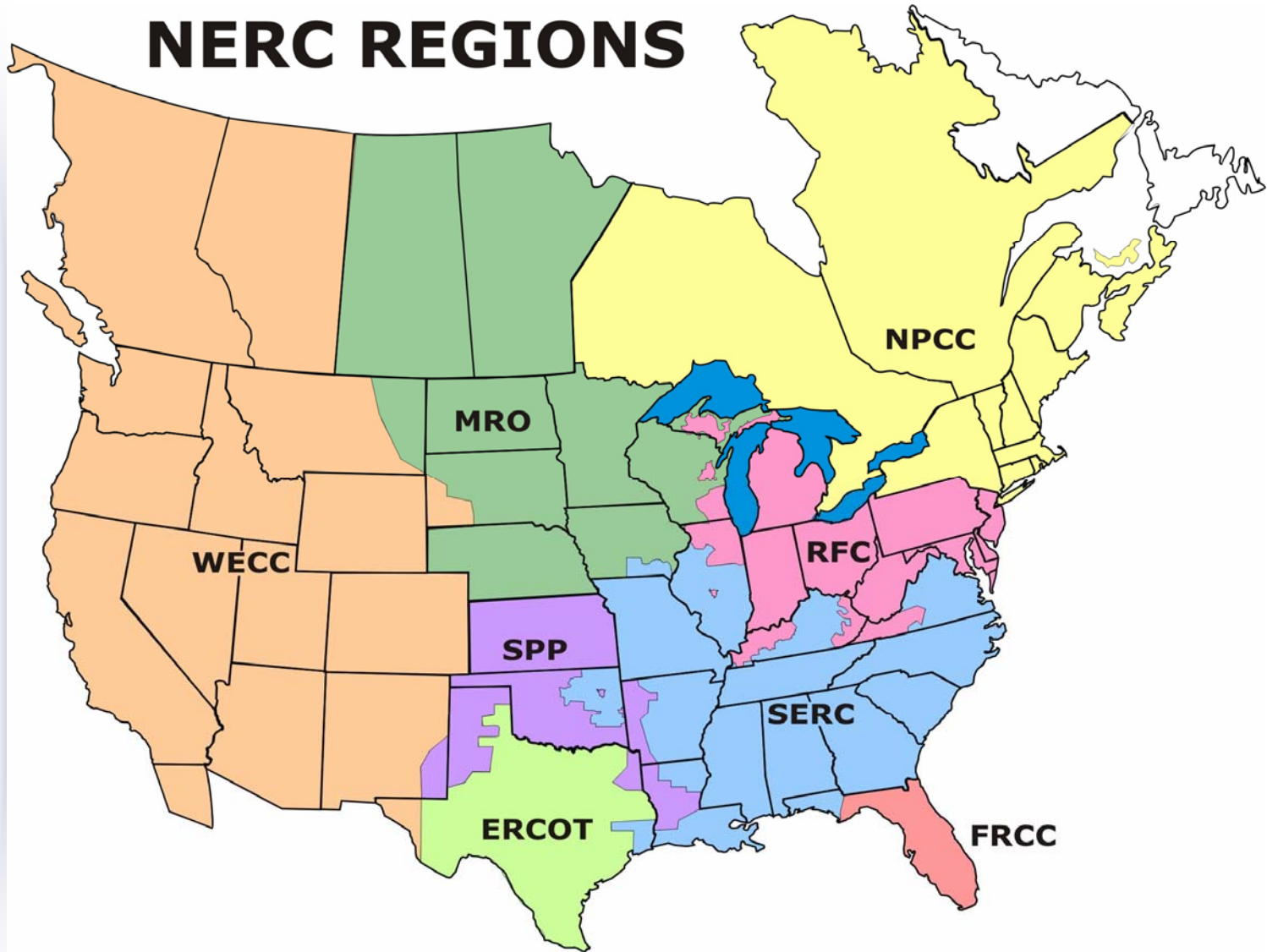
ReliabilityFirst (RFC)

South East (SERC)

South West (SPP)

Western (WECC)

NERC REGIONS



NERC's Activities

- **Sets Standards for the reliable operation of the BES**
 - NERC Standards represent minimum requirements
 - Each Region may have its own more stringent (or less stringent) requirements (Regional Differences)
 - Enforcement by the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Organization (NAERO) only if part of the Standard
- **Monitors, assesses and enforces compliance with standards for bulk electric system reliability.**
- **Reviews new and modified facilities development**
- **Certifies reliability service organizations and personnel**
- **Assesses BES Adequacy and Performance**
- **Investigates System Disturbances**
- **Coordinates critical infrastructure protection of the BES.**



NERC Compliance

Old World

- ▲ Self Certification
- ▲ Limited Documentation and Compliance Reporting
- ▲ Compliance audit (lately becoming more rigorous and exhaustive)

Slowly transitioning to the New World:

- ▲ 1995: NERC filed a six-point action plan that formed the Electric Reliability Panel (ERP) to recommend how to ensure maintaining reliability in competitive market and ensuring compliance with NERC rules
- ▲ 1997: ERP recommended to re-structure NERC into NAERO, self-regulating organization with authority to set, measure and enforce reliability and planning standards.

NERC Compliance

Process accelerated in the aftermath of blackout: US-Canada Blackout Report; Recommendation # 25: "A strong transmission system designed and operated in accordance with weakened standards would be disastrous. Instead, a concerted effort should be undertaken to determine if existing reliability criteria should be strengthened.... Only through strong standards and careful engineering can unacceptable power failures like August 14, 2003 be avoided in the future."

In August 2005, President Bush signed the Energy Policy Act Pursuant to Subtitle A (Reliability Standards) of the Electricity Modernization Act of 2005.

- Establishes NAERO that will propose and enforce Reliability Standards for the Bulk Power System subject to FERC approval;
- Enforcement actions by the ERO and FERC.
- Can delegate compliance some of standards development activities to Regional Entities
- Expected to begin operations on January 1st, 2007
- Only USA as Canada not under FERC's jurisdiction.



NERC Compliance

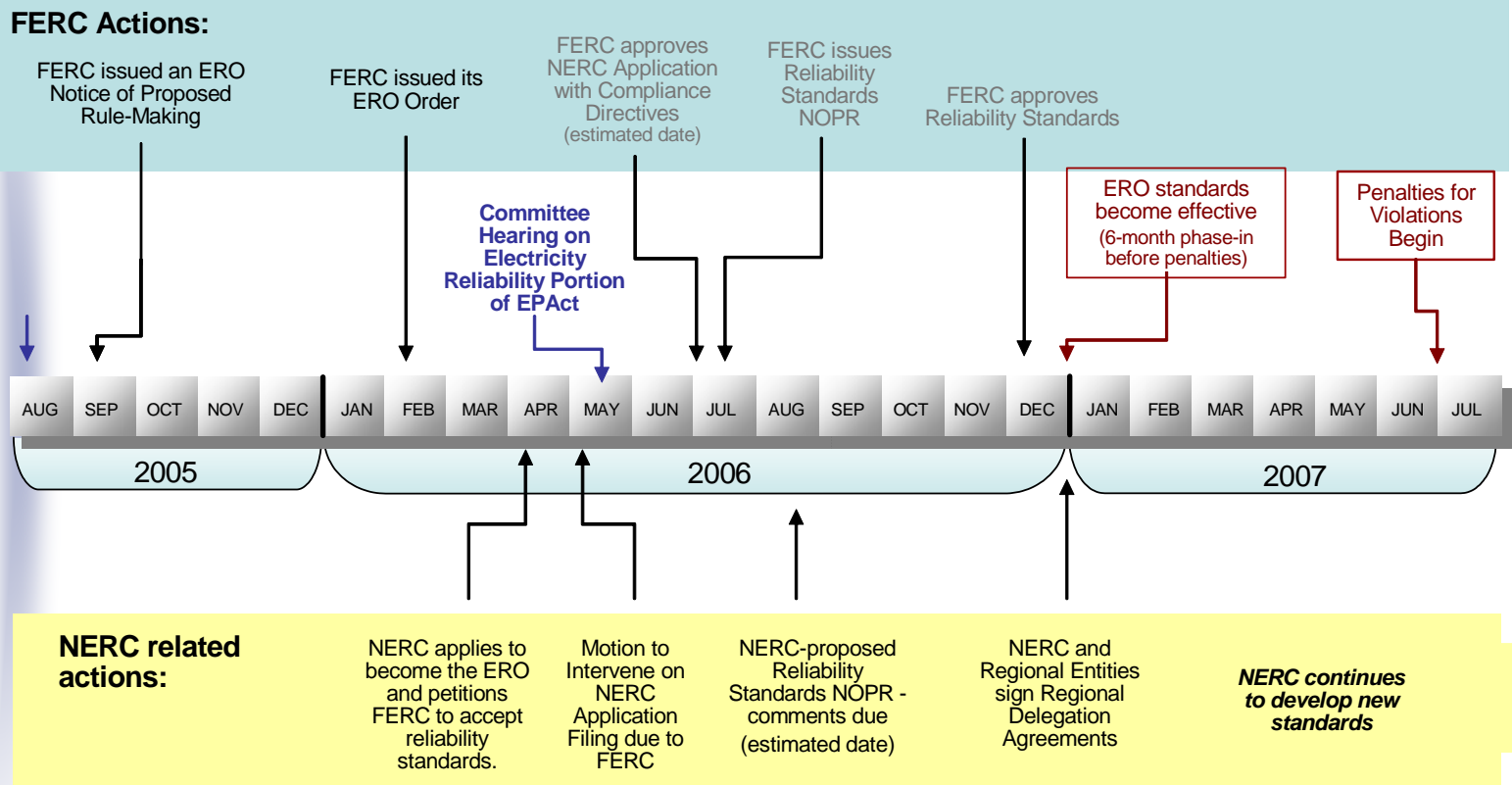
- **FERC - NEB MOU (May 2004): Enhanced coordination of Regulatory responsibilities.**
 - **Canada will have symmetric compliance enforcement requirements.**
- **NERC applied (April 4th) to become the NAERO**
- **Canadian Utilities are Not under FERC's jurisdiction:**
 - **NERC filed Applications for recognition (including Reliability Standards) with NEB, OEB and Ministry of Energy of Alberta**
 - **NERC has submitted Notice of filing to BC Utilities Board, Ministries of Energy of Saskatchewan, Manitoba and New Brunswick and the Régie de l'énergie of Quebec**



NERC Compliance

- **NERC will transition to not-for-profit corporation known as the North American Electricity Corporation (still use NERC acronym)**
- **Reliability Standards:**
 - Separate submission to deal with the 102 NERC standards to the provinces, NEB and FERC
 - FERC Staff issued preliminary assessment:
 - NERC Standards are solid foundation.
 - Cites various deficiencies
 - Invites comments
 - FERC to receive industry comments until June 26.
- **OEB intends to acknowledge NERC's applications**

Time Line



The Past

What's Changing

No federal Law
No FERC involvement

Federal Level

EPAct 2005 resulted in heightened accountability for system reliability
FERC oversight of all reliability standards and enforcement

A weak NERC
Voluntary standards

North American Electric Reliability Council
(NERC)

A strong "Electric Reliability Organization" (ERO)
Likely to be NERC
Drives and enforces approved reliability standards

Ten regional councils
Standards vary between regions

Regional Reliability Councils

Regional Councils with enforcement authority
Likely to be similar to today; some are merging
Effort to align regional standards

Voluntary commitment to standards

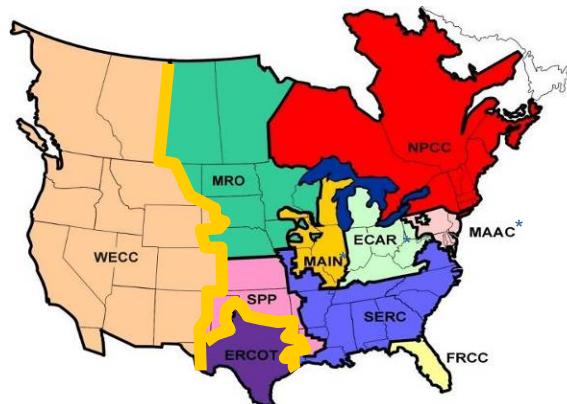
RTOs/ISOs

Must be auditably compliant with standards or face penalties

Voluntary commitment to standards

Transmission Owners

Must be auditably compliant with standards or face penalties



* ReliabilityFirst, the successor organization of MAIN, ECAR, and MAAC, to become a new Regional Reliability Council.



NERC Compliance

- **FERC staff assessment:**
 - **Blackout Report Recommendations:** Some not addressed in Standards
 - **Ambiguity:** Multiple interpretations
 - **Technical Adequacy:** May not be sufficient to ensure reliability
 - **Measures and Compliance:** Many missing
 - **Undue Negative Impact on Competition**
 - **Fill-in-the Blank Standards:** Broad directions to RROs. Concerns about uniform enforcement
 - **Applicability:** Undefined list of “users, owners and operators.” Needs to be clear.



NERC's Purview

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NERC's Purview

- **Bulk Power System (FERC)**

Facilities and control systems necessary for operating an interconnected electric energy transmission network (or any portion thereof), and electric energy from generating facilities needed to maintain transmission system reliability.

The term does not include facilities used in the local distribution of electric energy.



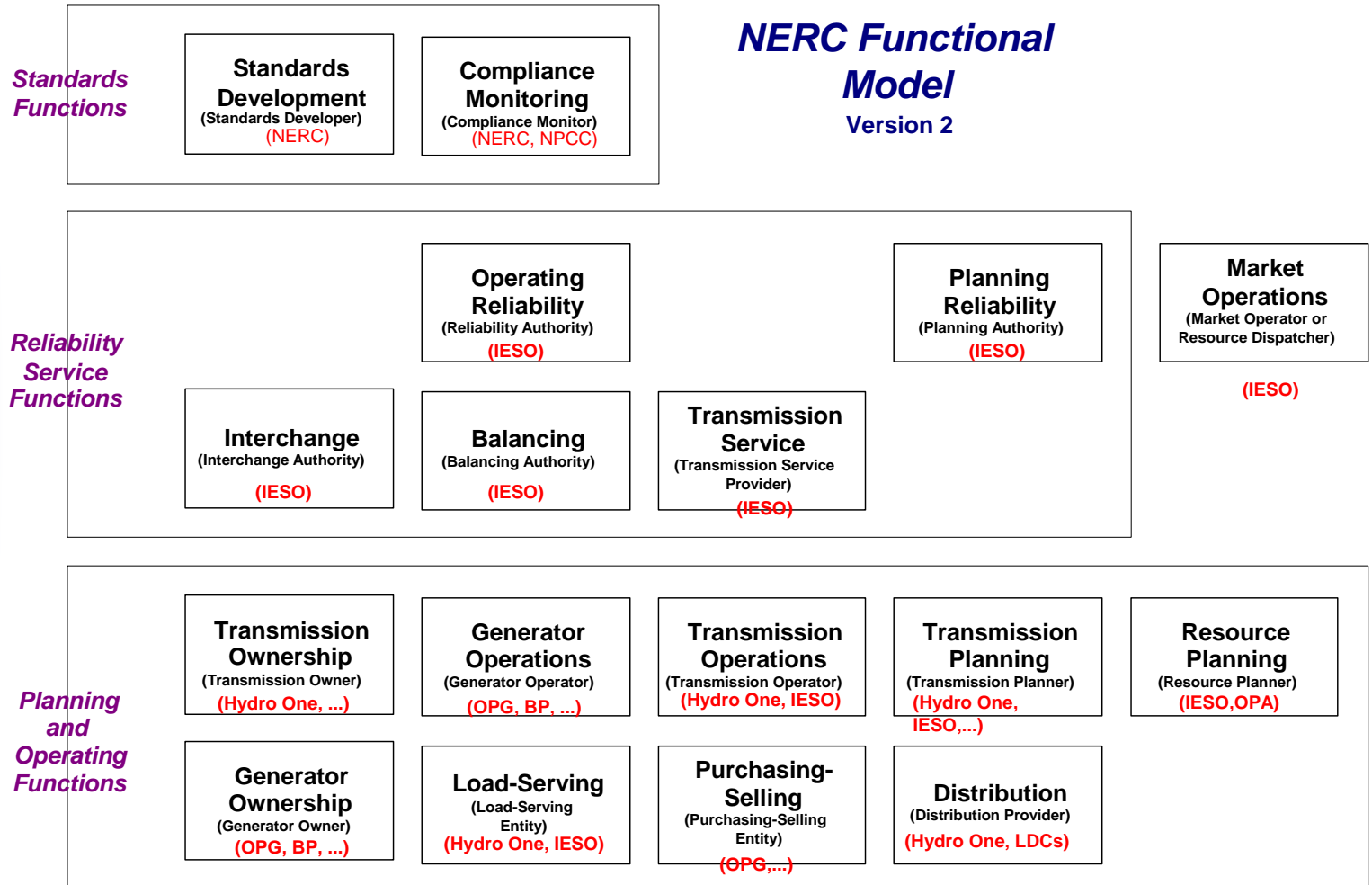
NERC's Purview

Bulk Electric System v. Bulk Power System

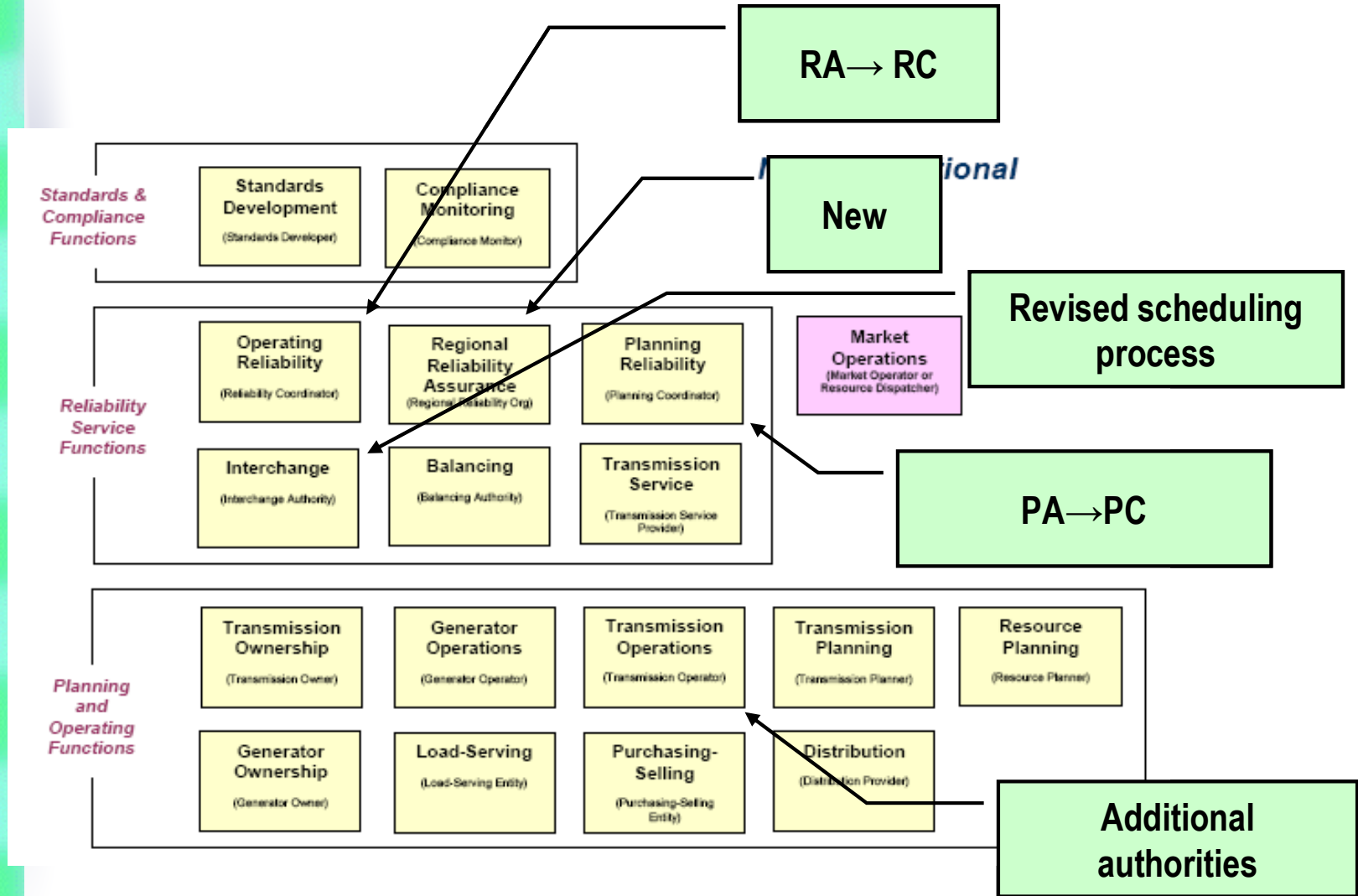
The differences between the definition of Bulk-Power System in section 215 of the FPA and the definition of Bulk Electric System found in the NERC Glossary upon which the NERC standards rely, create a problematic discrepancy that could create reliability gaps.

This discrepancy, if left unaddressed, will interfere with maintaining reliability consistently across the Regions and may be inconsistent with Order No. 672. This gap could allow for some interconnected electric energy transmission networks, and electric energy from generating facilities needed to maintain transmission system reliability to be outside of the mandatory Standards.

NERC Functional Model



NERC Functional Model: Version 3





NERC Standards

- **NERC standards modified extensively to clarify responsibilities & improve compliance monitoring**
 - Functional Model Development (who does what)
 - First adopted Standard: 1200 Urgent Action Cyber Security (16 Standards), now to be replaced by the CIP-002 through CIP-009 Permanent Standard
- **Translation of old policy and guidelines documents to ANSI approved standard format: Version 0 standards: 90 Standards, 859 Requirements**
- **Business practices in old documents referred to the North American Energy Standards Board (NAESB)**
- **http://www.nerc.com/~filez/standards/Reliability_Standards.html**



NERC Standards Format

Standard:

- Identification Number
- Title
- Effective Date and Status
- Purpose
- Requirement(s)
- Measure(s)
- Compliance Monitoring Process
- Levels of Non-Compliance

Complementary Documents:

- Implementation Plan
- Definitions of Terms: —→ Glossary of Terms
- Supporting Information:
 - Interpretations
 - References



Types of NERC Standards

- ◆ Resource and Demand Balancing: BAL-*nnn-v*
- ◆ Critical Infrastructure Protection: CIP-*nnn-v*
- ◆ Communications: COM-*nnn-v*
- ◆ Emergency Preparedness and Operations: EOP-*nnn-v*
- ◆ Facilities Design, Connections and Maintenance: FAC-*nnn-v*
- ◆ Interchange Scheduling and Coordination: INT-*nnn-v*
- ◆ Interconnection Reliability Operations and Coordination: IRO-*nnn-v*
- ◆ Modeling, Data, and Analysis: MOD-*nnn-v*
- ◆ Organization Certification: ORG-*nnn-v*
- ◆ Personnel Performance, Training, and Qualification: PER-*nnn-v*
- ◆ Protection and Control: PRC-*nnn-v*
- ◆ Transmission Operations: TOP-*nnn-v*
- ◆ Transmission Planning: TPL-*nnn-v*
- ◆ Voltage and Reactive: VAR-*nnn-v*



NERC Entity Registration

- **85 Entities Registered in Ontario (as of March 2006):**
 - Reliability Coordinator (1 Entity), Balancing Authority (1), Planning Authority (1), Transmission Service Provider (1): **IESO**
 - Resources Planner (2): **OPA, IESO**
 - Load Serving Entity (2): **Hydro One, IESO**
 - Transmission Planner (5): **Hydro One, IESO, CNP, GLP, FNE**
 - Transmission Operator (3): **Hydro One, IESO, FNE**
 - Transmission Owner(12): **Hydro One, CNP, FNE, HO Brampton, Hydro Ottawa, PowerStream, Toronto Hydro, etc.**
 - Distribution Provider (9): **HO Brampton, Hydro One, Hydro Ottawa, Toronto Hydro, PowerStream, etc.**
 - Generator Owner (28): **Abitibi, Bruce Power, GLP, Imperial Oil, OPG, Transalta, etc.**
 - Generator Operator (22): **Abitibi, Bruce Power, GLP, Imperial Oil, OPG, Transalta, etc.**
 - Purchasing Selling Entity (45): **Direct Energy, GLP, HQ, MH, NYPA, OEFC, OPG, DTE, Toronto Hydro, Transalta, etc.**



NERC STANDARDS PROCESS

- ◆ Requests to develop a new (or modify existing) standard (Standard Authorization Request or SAR) submitted to Standards Authorization Committee (SAC)
- ◆ SAC appoints SAR Team to define scope of standard.
- ◆ SAR is posted for Industry comments. Several iterations until approved.
- ◆ SAC approves Final SAR and appoints Drafting Team
- ◆ Standard Drafting Team develops the standard
- ◆ Draft posted for Industry comments: several iterations until ready for balloting.
- ◆ Ballot Pool constituted by registered members of nine industry segments with each having equal weight (e.g. Transmission Owners, ISOs/RTOs, End Users, etc.)

NERC STANDARDS PROCESS

- ◆ Ballot Pool constituted by registered members of nine industry segments:

Segment	Registered Pool
– Transmission owners	121
– RTOs, ISOs, and Regional Reliability Councils	25
– Load-serving entities	102
– Transmission-dependent utilities	39
– Electricity producers	86
– Brokers, aggregators, marketers	71
– End users (large)	22
– End users (small)	17
– Federal, state and provincial government agencies	19

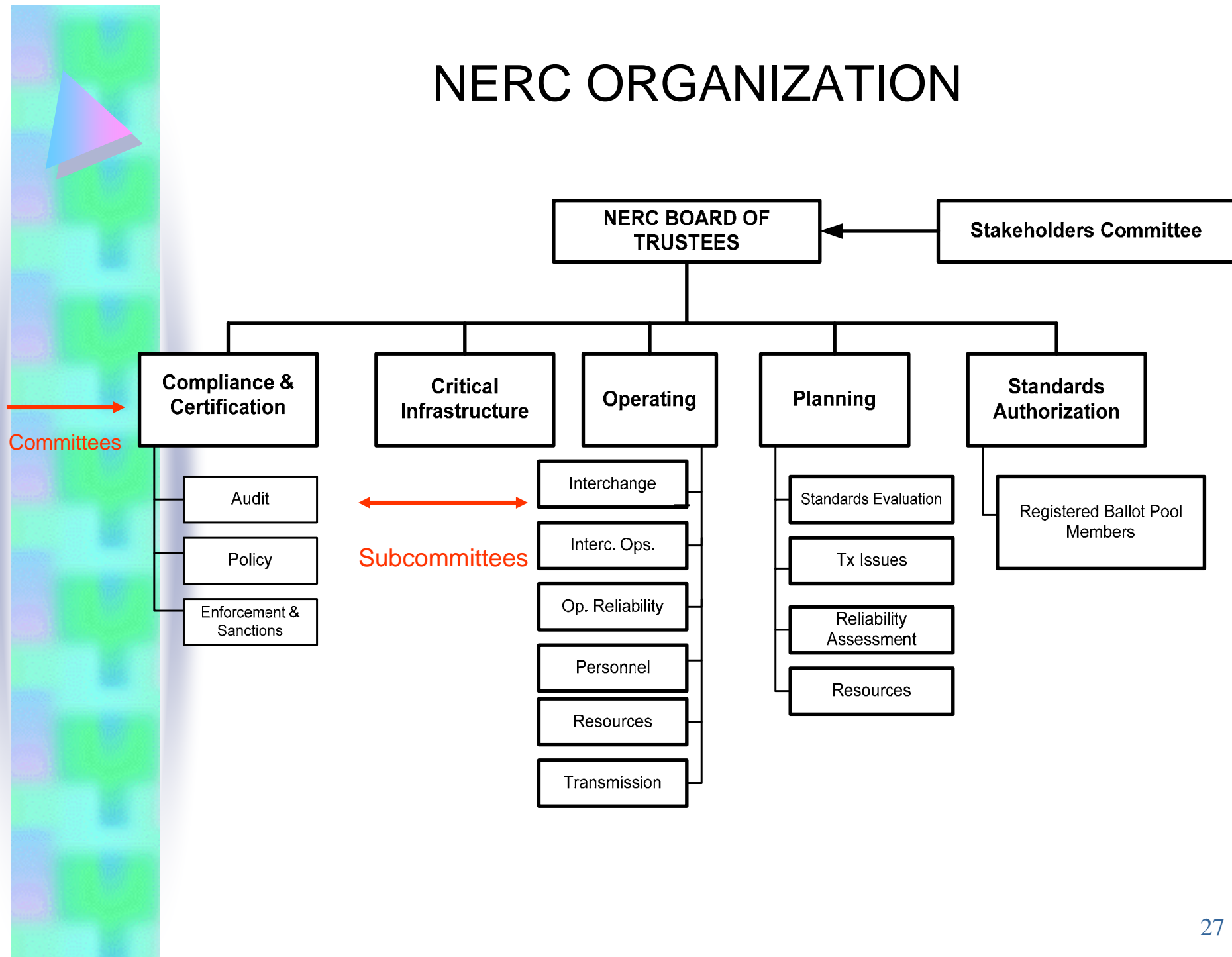
- ◆ Each segment has equal weight



NERC STANDARDS PROCESS

- ◆ Minimum quorum required for approval (75% of ballot pool members must submit vote)
- ◆ Minimum two-thirds approval among submitted votes required.
- ◆ Negative votes with comments trigger re-circulation vote.
- ◆ Second vote over same standard: no changes at this stage.
- ◆ Drafting team also develops implementation plan.
- ◆ After approved by vote, standard is finally adopted by NERC Board of Trustees.

NERC ORGANIZATION





NORTH EAST POWER COORDINATING COUNCIL (NPCC)

- ◆ Voluntary, non-profit organization formed in 1966.
- ◆ Represents Transmission Providers and Transmission Customers serving the northeastern United States and Central and Eastern Canada: Ontario, Quebec, Maritimes Provinces (NB, NS, PEI), 6 New England States (Massachusetts, Connecticut, Rhode Island, Vermont, New Hampshire, Maine) and New York State.
- ◆ Composition by load: ~ 45% U.S. and 55% Canadian
- ◆ Population served: ~ 56 million
- ◆ Square Km served: 2.6 million (1 Million Square Miles)
- ◆ Total customers served: 23 million
- ◆ Monthly Peak Load (2004 data): ~ 117,000 MW
- ◆ In Canada 70% of country's load within NPCC

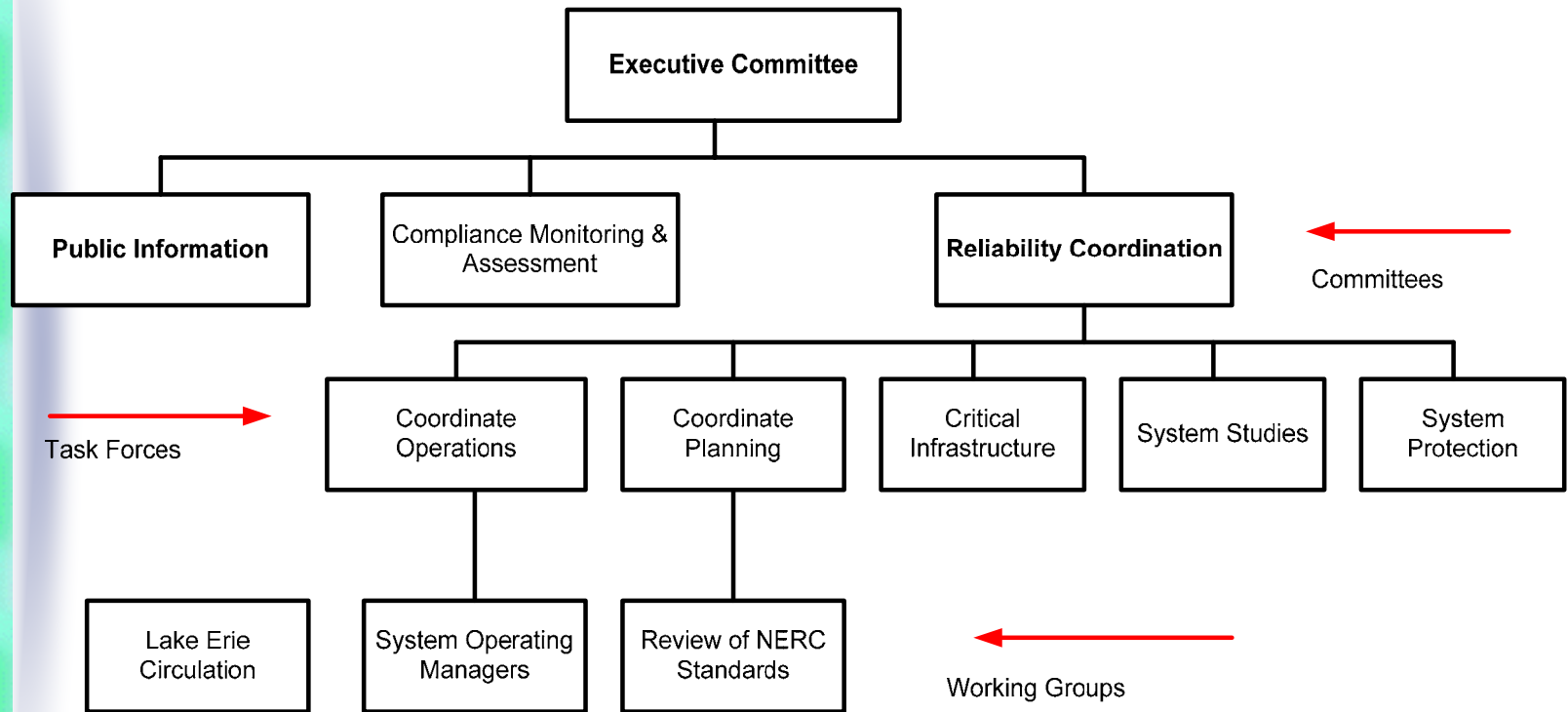
NPCC Areas



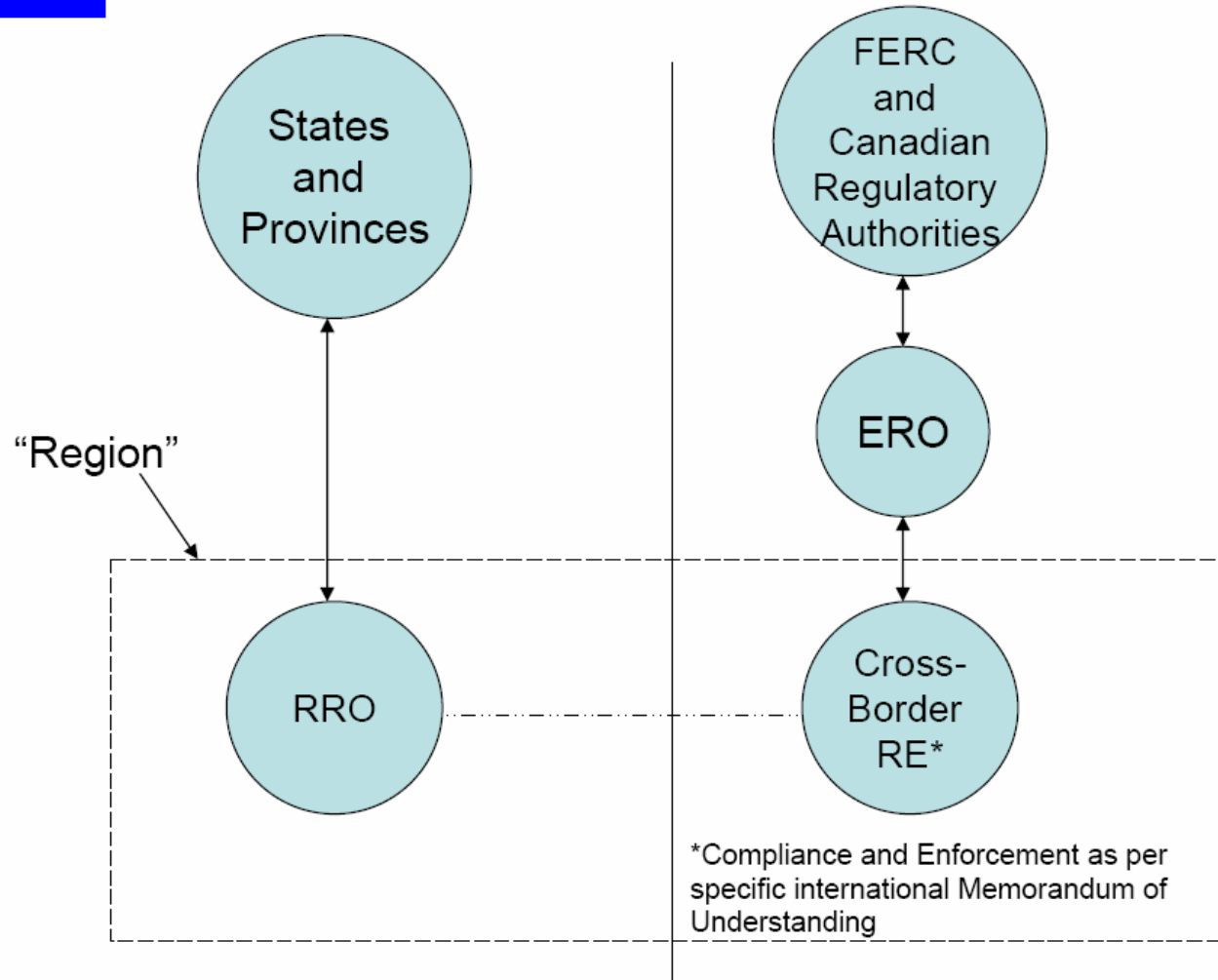
NPCC

- **Develops Regional- specific standards**
 - among most demanding of 8 NERC regions
 - developed by NPCC technical Task Forces
 - approved by member vote
- **Monitors and Enforces Compliance**
 - Each Member signs Membership Agreement: bound to plan, design and operate by NPCC Criteria
 - ISOs identify alleged violations
 - NPCC reviews and applies sanctions
- **Coordinates Planning**
- <http://www.npcc.org/documents.asp>

NPCC Organization



NPCC Structure (Future)



NPCC DOCUMENTS

- Criteria ("A" Documents). **Examples:**

- A-02 “Basic Criteria for Design and Operation of Interconnected Power Systems”
- A-03: “Emergency Operation Criteria”

- Guides ("B" Documents). **Examples:**

- B-07 “Automatic Underfrequency Load Shedding Program Relaying Guideline”
- B-13 “Guide for Reporting System Disturbances”

- Procedures ("C" Documents) . **Examples:**

- C-13 “Operational Planning Coordination”

Must Do

Implementation guide

Conformance Process