The Dawning of a New Era

"On June 4,2007 Power Grid Reliability enters a New Era "

Presented to

APEGM

Breakfast Meeting

at

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Overview of North America's Power Grid Reliability Regimes

- A Storied History 1965-1992
- A Promise of lower prices-open access et all -1995 to 2005
- The paradigm shift begins
- "The beginning of the end of voluntary reliability standards"
- Manitoba Hydro's Game Plan

1965 to 1996
"The Old Boys' Club"

- November 1965 East Coast Blackout
- Formation of voluntary North America Electric Reliability Council (NERC) and voluntary standards
- Over time 10 Regional Reliability Councils owned NERC...a bottom up organization
- Brought Industry closer together
- NERC Focus on Operating and Planning Policies
- Violations (disturbances) were reported and resolved

1992 to 1995
"Let the Fun Begin"

- U.S. Energy Policy Act 1992
- Telecom, airlines, and other industries de-regulate, re-structure
- Other electricity jurisdictions in the world re-structuring
- Why not U.S. electrical industry?
- Competition!
- Robust wholesale electricity markets!
- Retail, even!
- Canada , i.e, Ontario and Alberta jump in!

1996 to 2005 "Paradigm Shift"

- Transmission open access and generation competition heats up
- New Rules !
- "Old Boys' Club" is re-thinking its role in 1997
  - Governance
  - Independence
  - NEW PLAYERS!
  - Blue Ribbon Panel
- Then Two blackouts in 1996 in U.S. West
- Suggestions that de-regulation to blame!
- Numerous draft Bills go to Congress without success – not even the Eastern Blackout (August 14, 2003) pushed a bill through quickly

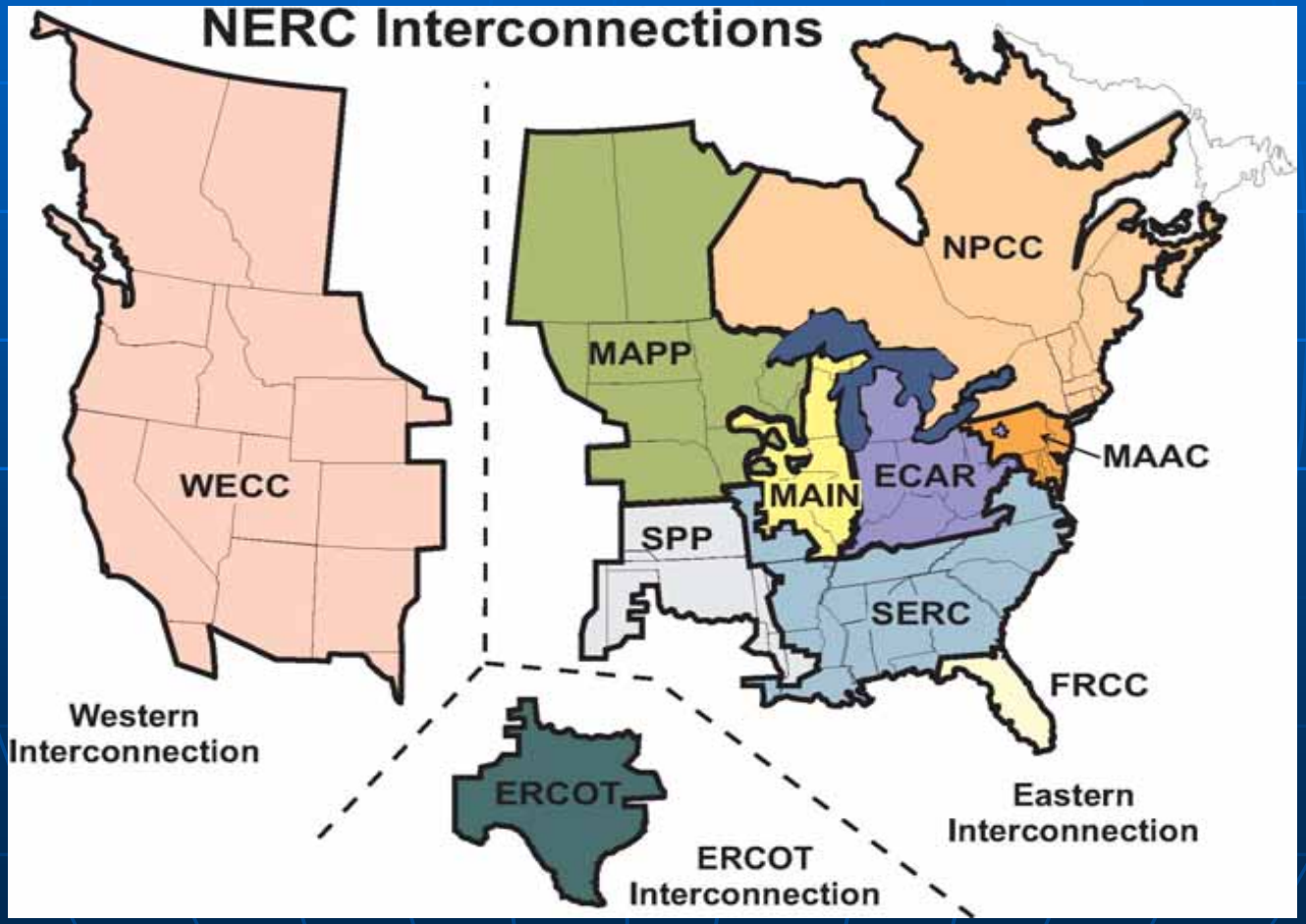
The New Boys' Club 2000
"NERC GOES INDEPENDENT"

- In time for the new Millennium?

Or

- Real Industry need?

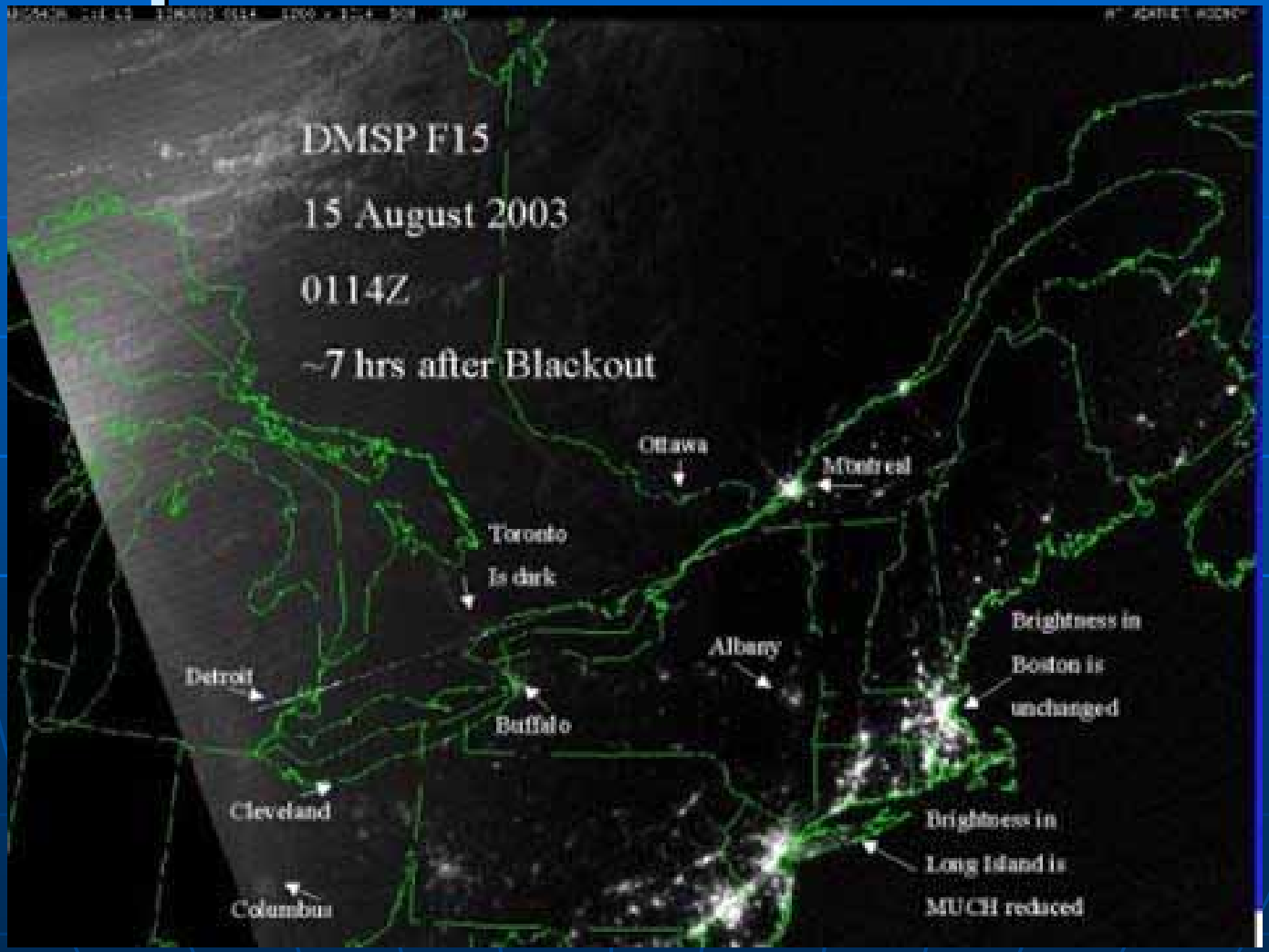
Managing Reliability
in
North America
Three Interconnections/Ten NERC Regions



Midwest Reliability Organization Jan.1, 2003

- Based on draft U.S. legislation
- Becomes MRO Jan.1,2003…1st of 10 Regions to comply with draft Legislative model
- MH has seat (Canadian Utilities Sector) on balanced Stakeholder Board
- Sask Power joins in 2006
- MRO includes northern Wisconsin

August 14, 2003
"Spurred new standards"



Finally, on August 8, 2005

"New U.S. Energy Policy Act (EPACT)"

- Mandates an Electricity Reliability Organization (with International recognition – A CHALLENGE !)
- Reliability Standards will be Mandatory and Enforceable, with sanctions and financial penalties
- ERO will be a top-down organization
- What is Canada?, Manitoba?, going to do?
- Feds, CEA, and FPT and others have been engaged for years
- In Canada electricity is a provincial jurisdiction

Cementing the Cornerstones for the new NERC

- Joint Canada/U.S. Blackout Task Force
- BEROG-sets the principles for an International Reliability Organization
- U.S.- Canada sign MOU
- BEROG will exist to “mediate “ difficult issues, e.g, Remands, Multi-Jurisdictional processes

ERO – Electricity Reliability Organization
FERC certifies NERC July, 2006

The Vision: "An international self-regulating organization (for U.S., Canada, and Mexico) with light-handed regulatory (legal) backstop."
….

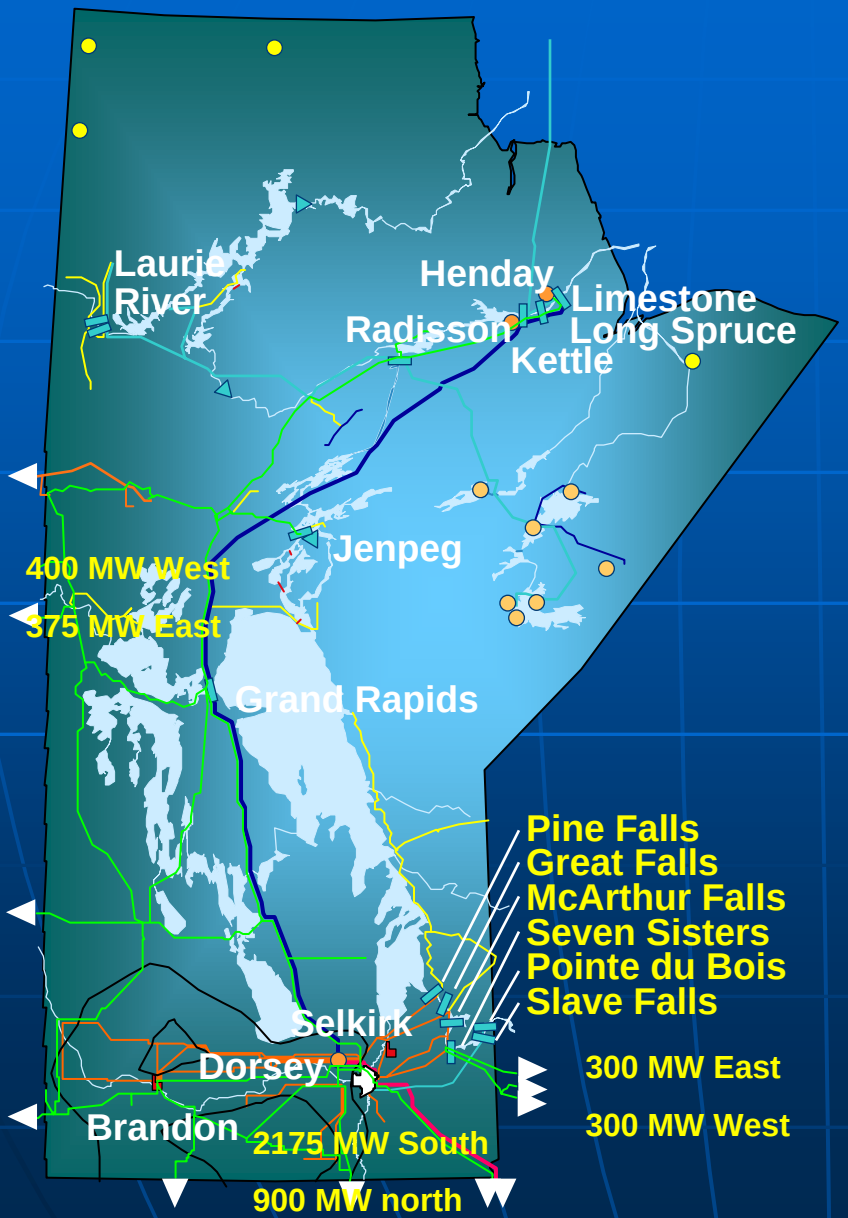
The Reality: "FERC's heavy hand over reliability in the U.S. gets heavier and heavier…… and "reaches" into Canada?..

Reliability Standards ??

- Rules for the planning ,design, and operation of generation, transmission & major loads within the Grid, and provide continuous supply at acceptable voltage and frequency, and minimize instability, uncontrolled separation, cascading failures and uncontrolled flows

Overview of Power System

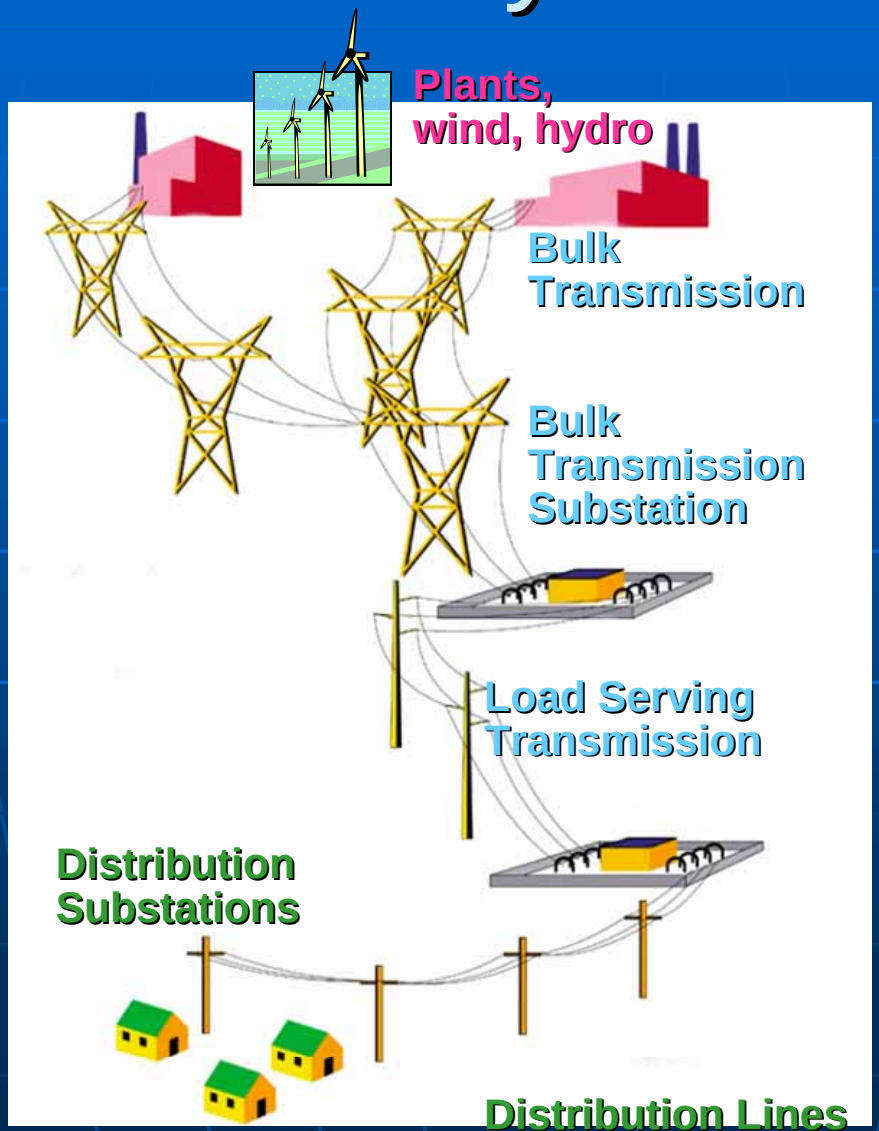
Interconnections



Manitoba Hydro System and Interfaces

Winnipeg River – 560 MW
Selkirk – 132 MW
Brandon – 365 MW
Grand Rapids – 472 MW
Jenpeg – 168 MW
Kelsey – 224 MW
Kettle – 1272 MW
Long Spruce – 980 MW
Limestone – 1350 MW
Wuskwatim – 200 MW
Gull – 600 MW
Conawapa – 1380 MW

How The System Works



Power is generated or purchased

Bulk transmission (>115kv) moves the power to transmission substations

These substations drop the voltage down

Load serving transmission (<115kv) moves the power to the distribution substation

Distribution substations drop the voltage down

Distribution lines move the power to business, industrial and residential customers

Compliance by Manitoba Hydro

- Why comply?
  - Voluntarily complying for years with voluntary standards
  - Contractual with MRO
  - Good business practise
  - Managing MH market access risks
  - Improves grid reliability
  - It will be the law in Manitoba
  - Consider the alternative of doing nothing !

- What are the consequences of non-compliance?
  - Sanctions and Financial Penalties ...and being noticed on a NERC public website
  - Penalties stiff enough to disincent deliberate violations to foster “economic choices”
  - June 4, 2007 is Day One of enforcement

How will anyone find out if MH is non-compliant ?

- Self-declared
- MRO/NERC Compliance Audit
- NERC Readiness Audit
- System Disturbance
- Spot Audits
- Complaints

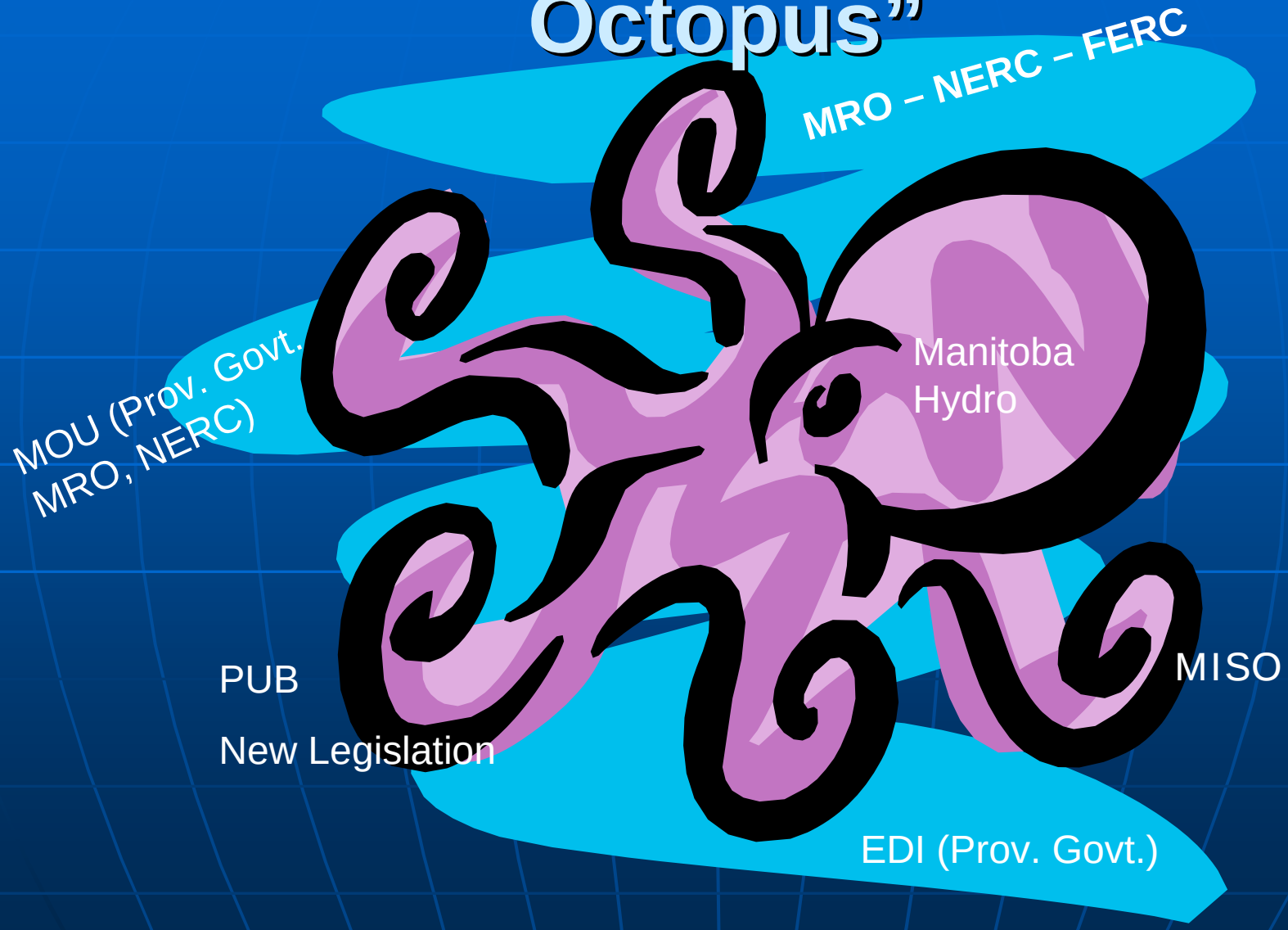
WHO will be the Compliance Police?

- The MRO

What's New or Different about Reliability Standards?

- More clarity and audit ability
- Applies to all owners, users, and operators of Grid
- Thousands of requirements and measures
- Specific requirements apply to specific entities...not every standard or requirement applies
- Violation Risk Factors...pre-assess consequences and may influence penalties
- Levels of Non-Compliance
- R.O.W. Vegetation Standard
- Cyber and Physical Security Standard
- Others

Impacts – "Managing an Octopus"



Standards & Compliance Management
"A true partnership"

- Standards and Compliance go together
- MH Reliability Standards Compliance program
- Manitoba Hydro involvement in the Industry

High Violation Risk Factors with Significant Penalties for Non-Compliance

- Contingency Reserves-to comply with Disturbance Control Standard
- Load shedding plans must all co-ordinate with Interconnected TOs and BAs
- TOs and BAs must be staffed with certified operators
- TO, GO and DP must analyze all protection system misoperations

High Violation Risk Factors with Significant Penalties for Non-Compliance

- GOs must provide info to TO re status of all reactive power resources, including status of VRs and stabilizers
- TO/BA experiencing an IROL or SOL violation must immediately relieve the situation, possibly shed firm load


24/5/2001

NERC's Game Plan Going Ahead
"Reliability Standards Development Plan 2007-2009 in response to FERC's Criticism"

- "The goal of the work plan is to ensure the entire set of standards provides an adequate level of reliability of the North American bulk power systems, and is enforceable upon all bulk power system owners, operators, and users, in accordance with applicable statutes and regulations in the United States and Canada."

New Standards coming down the Pipe

- 2006-02 Certifying System Operators
- 2006-04 Transfer Capabilities
- 2006-05 Phase III & IV Generator Capability Field Tests
- 2006-06 Transmission Assessments and Plans
- 2006-09 Balancing Authority Controls
- 2007-01 Underfrequency Load Shedding
- 2007-03 Real-time Transmission Operations
- 2007-04 Emergency Operations
- 2007-05 System Restoration
- 2007-06 Generator Verification
- 2007-10 Disturbance and Sabotage Reporting
- 2007-11 Connecting New Facilities to the Grid

New Standards cont'd

- 2008-01 Voltage and Reactive Control
- 2008-03 Disturbance Monitoring
- 2008-04 Blackstart
- 2008-05 Demand Data
- 2009-01 System Protection
- 2009-02 Protections Systems
- 2009-03 Reliability Assessments
- 2009-05 Vegetation Management
- 2009-06 Cyber Security

Standards Addressing
August 2003 Blackout Recommendations

- 2006-07 Frequency Response
- 2006-10 Resource Adequacy Assessments
- 2007-08 Back-up Facilities
- 2007-09 Phasor Measurement Units
- 2008-02 Undervoltage Load Shedding

Issues & Challenges for MH

- Managing MH's transition to June 4,2007
- Draft Manitoba Legislation/regulations 2007
  - Protect sovereignty
  - Assure funding and enforcement
  - Hear complaints
  - Remands
  - Approve penalties

- MH experts on Standards Drafting Teams and other NERC/MRO bodies
- Impacts on MH Grid ??
- Impacts on Market Access ??
- Reputation as an excellent dependable supplier

Websites

- www.nerc.com
- www.midwestreliability.org
- www.ferc.gov

Closing Comments

- It took 10 plus years to get here
- It will take several years to mature and develop right culture in North America
- Violations will decline with time in North America –in my opinion
- R &D opportunities
- Aging Infrastructure
- Aging Workforce
- Grid reliability and consumers benefit

Thanks for Listening!