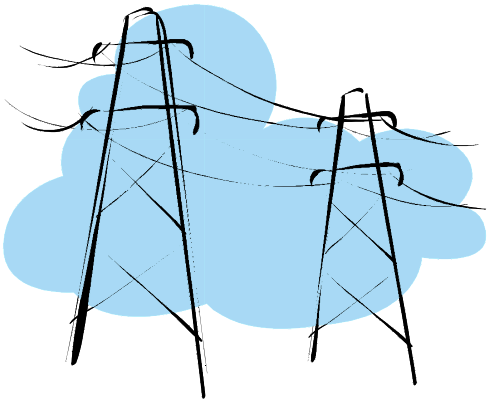
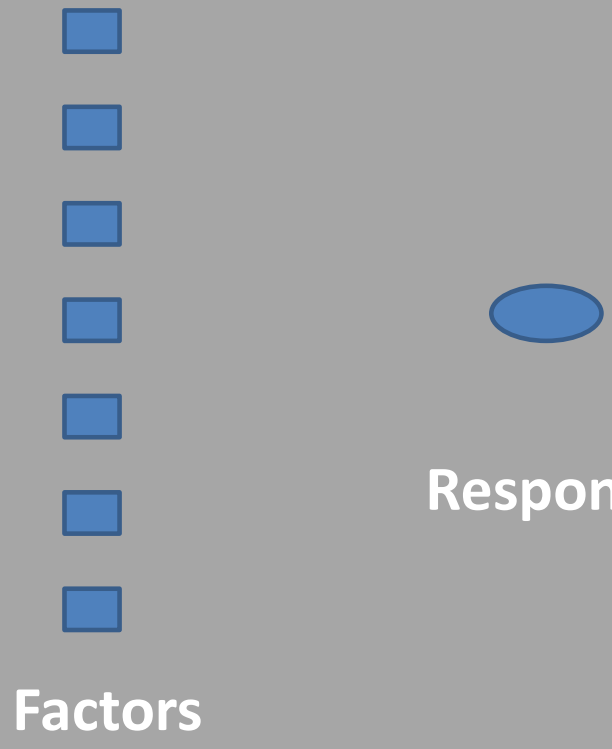


Transmission Reliability Performance Metrics

November 5, 2009

Transmission reliability metrics are more complex due to many factors



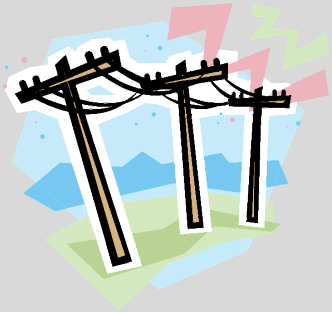
Performance metrics are driven by key factors.

Although likened to distribution metrics, transmission reliability metrics are more difficult to construct (and predict behavior) than distribution reliability metrics due to a large number of influencing factors.

Grid configuration, flows, and robust structural design sets transmission apart

Distribution

Radial Flow



Transmission

Bi-Directional Flow

REDUNDANCY is a key physical difference for transmission.

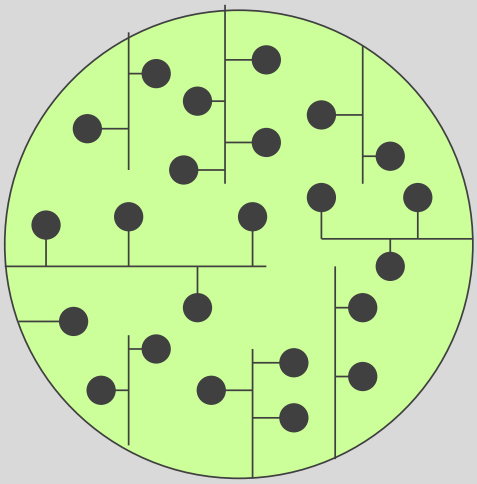
It's so significant that regulatory precedence has already been established on distribution performance metrics. [Consolidated Edison's urban distribution network is examined separately by New York Public Service Commission.] The design of transmission structures makes transmission more robust, but not immune, to severe weather challenges.

FOR Example:

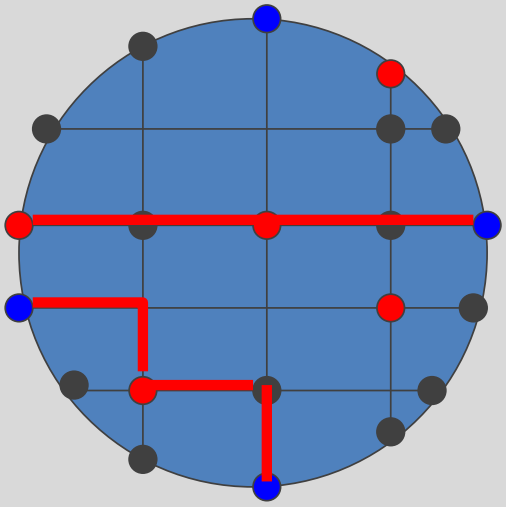
- 10/13/09 Path 15 transmission outage due to severe weather in CA leads to CAISO emergency
- January 2009, Tulsa, OK ice storm cuts transmission for nearly a month in southeast MO & northeast Arkansas
- The 1992 ice storm cripples Quebec's transmission for months.
- December 2008, Hawaii Electric experienced an island wide outage due to lightning shield backflash-overs on the 138kV system.

Multiple functions of transmission vs. Load Serving distribution function

Distribution



Transmission



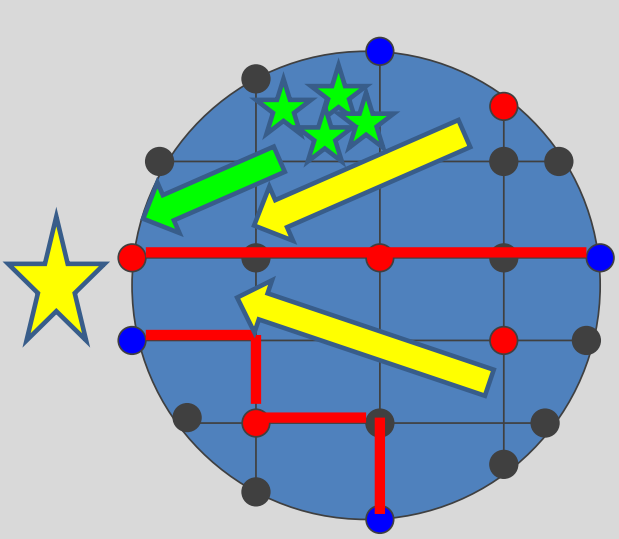
Generation
Interconnection
Load

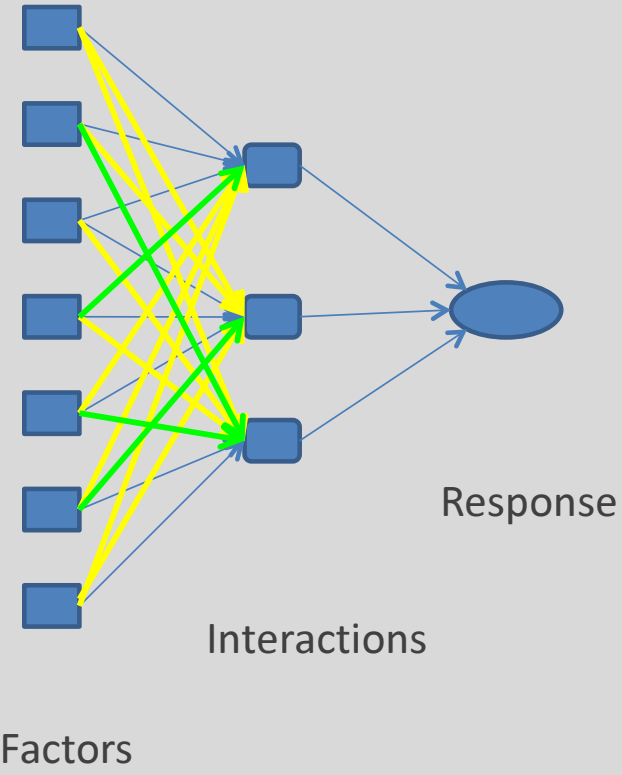
Circuit
Switching
Substation
Critical Path

Both transmission and distribution have **GEOGRAPHIC** and **ASSET BASED FOOTPRINTS**, but the meshed configuration of transmission is significantly different than the radial configuration of distribution.

Transmission has diversity of delivery point functions:
LOAD, GENERATION, INTERCONNECTION with neighboring systems

Transmission is subject to significant market interaction



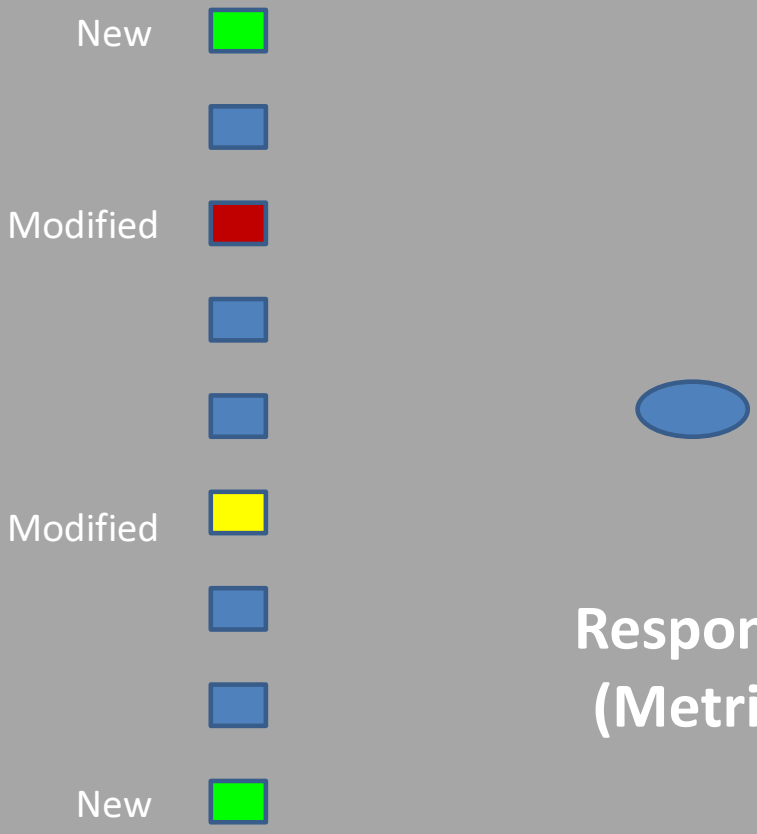


Many active stakeholders involved in transmission as opposed to a single regulated entity in distribution.

Price of energy and individual market participant profit strategies add unpredictability to generation patterns and power flows.

Planned outages account for most of the congestion and re-dispatch. In distribution planned outages account for a small fraction of the customer outages and outage minutes.

The transmission industry is undergoing significant change



The industry is undergoing significant changes. This adds complexity as new factors emerge and existing factors adjust to industry changes.

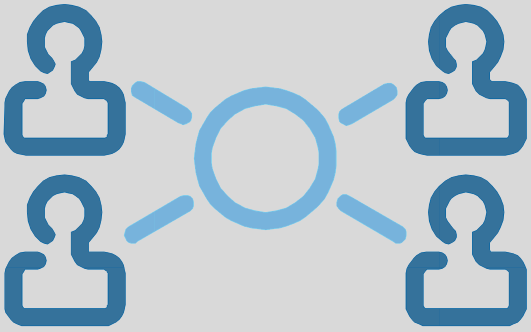
The physical attributes of the transmission grid are changing

How transmission is connected is changing: Interties proposed for Texas/NM – Eastern and Western grid links: Effects: Increased dependence of formerly stand alone grids increases cascading vulnerability. Expansion of market trading range.

The physical elements are changing: The influx of static devices and the resultant system stiffening to dynamic conditions and disturbances.

How transmission is used is changing: Annual load growth of 1.5% exceeds transmission expansion resulting in higher utilization of existing assets and reduced thermal margins.

The ownership and organization of utilities in the industry is changing



Transmission organizations are more responsive to global economic conditions than their former regional legacy company counterparts due to three significant industry organizational changes:

- The re-organization into regulated and unregulated holding company subsidiaries.
- Merger and acquisition activity in the North American market.
- The growth of international and private ownership partners.

How we envision transmission grid use and its functionality is changing

Smart Grid initiatives

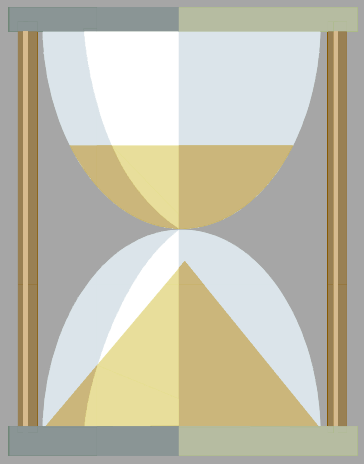
Alternative energy growth and energy generation dispatch patterns

Green Energy initiatives and emissions trading, SUSTAINABILITY focus

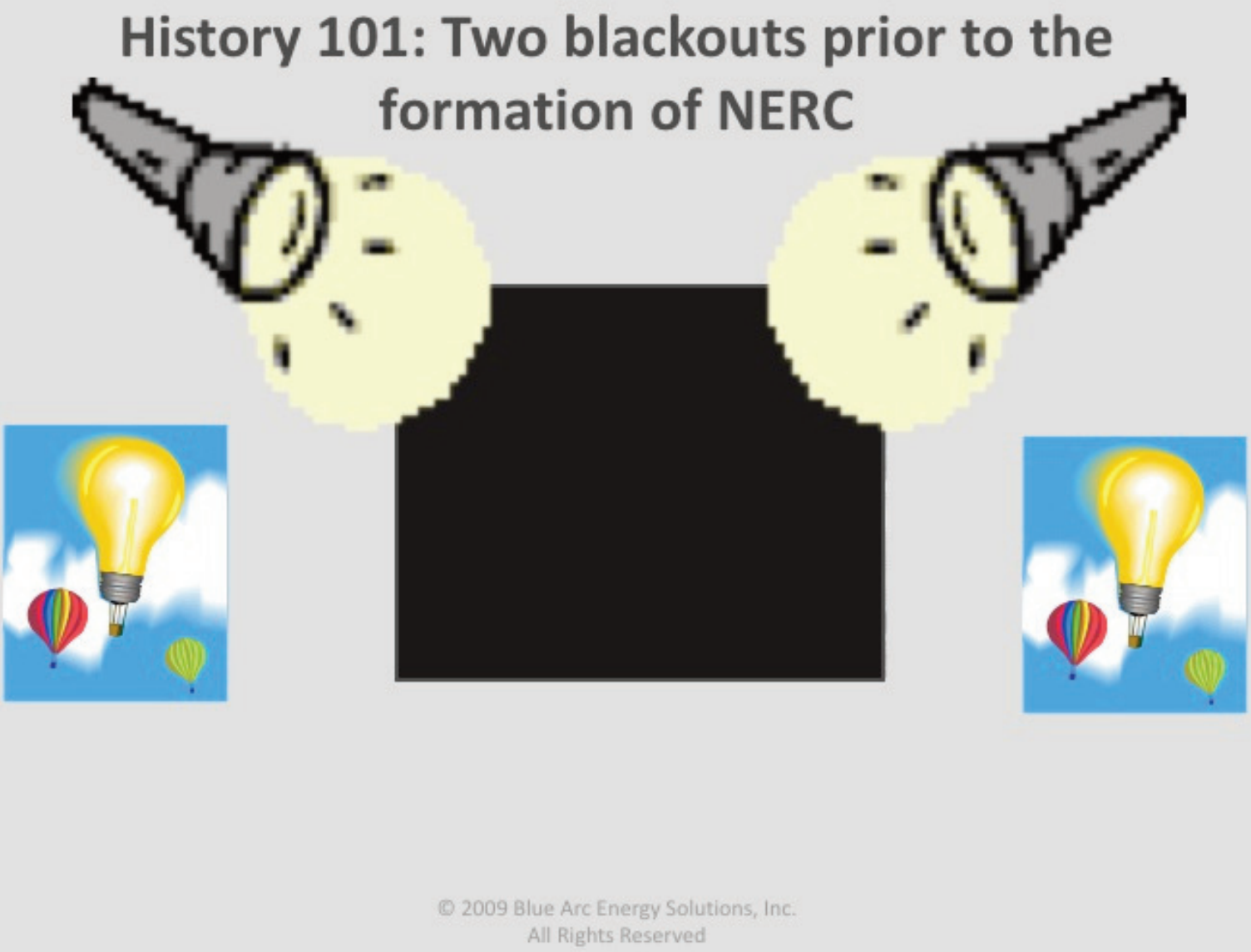
Transmission industry change adds more complexity to task of transmission performance metric development:

- Grid attributes and utilization levels are changing
- Complex organizational structures more prevalent
- Organizations are at risk to global economic pressures

Transmission reliability performance metrics development takes time



Experience indicates that transmission reliability performance metric development work is slow going.



IEEE Standard 859, 1988 transmission data definitions; a driver in this development was the large influx of nuclear generation and the need to review credible contingencies for loss of off-site transmission.

Transmission Line Availability Data (TLAD) working group of SGS benchmarking participants 1.5 yrs, 2001-2002. A consensus document that provided guidance on transmission line outage reporting and data collection.

EPRI Transmission Metrics Group Phase 1 begins summer 2003.

2003 Blackout initiates change. FERC gains authority of grid reliability 2006

EPRI Transmission Metrics Group Phase 3 finishes fall 2007. A consensus process that developed frequency, duration, and impact metrics.

NERC TADS WG begins 2007.Phase 1 completion, 2008,

NERC TADS WG Phase 2, 2009. A process that developed system outage metrics integrated with NERC planning criterion.

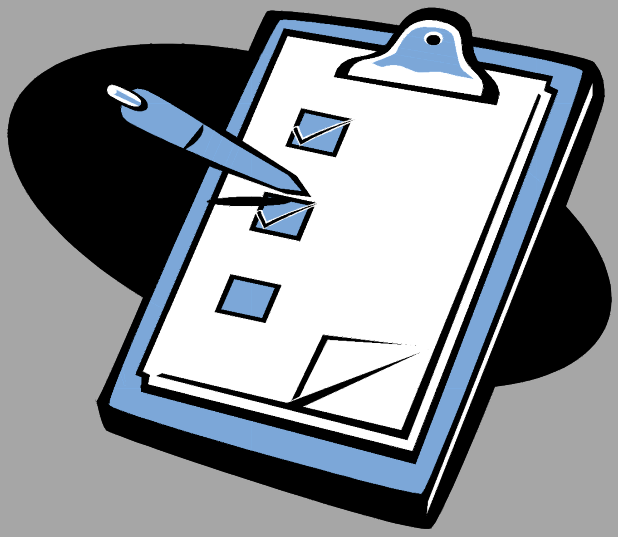
NERC RMWG working group formed in May 2009

1965 1977 2003 2009

Nine Metrics initially proposed, for long term grid performance trending, but the field will change.

You'd like to see your horses race before you place your bets …

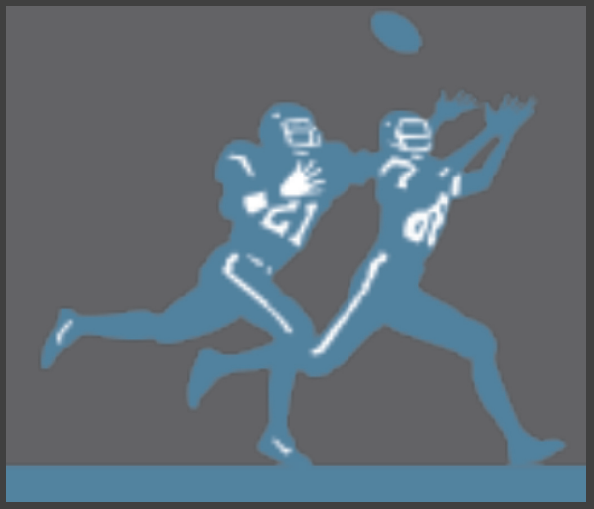
Complexity & Change with Time Ticking



✓Complexity
✓Change
✓ Clock

- Development of good transmission performance metrics is inherently more complex than distribution reliability metrics.
- In addition, the transmission environment is in the midst of significant change due to several forces and societal initiatives which further complicate the task.
- The industry sanctioning is dependent upon a consensus process. Consensus is uniquely idiosyncratic and characteristically slow.
- Blue Arc Energy Solutions can prepare your organization for the new business environment and the next industry metrics undertaking.

Blue Arc Energy Solutions , Inc.
your advantage in performance intelligence



Contact us to gain your strategic advantage in performance intelligence.