

TVA What is Reliability?

We say we are reliable, but what does that really mean?

- ◆ Electricity delivered in the right amounts precisely when and where it is needed
 - Three Components:
 - Power Supply
 - Transmission
 - Regional Coordination

- ◆ Maintain area reliability, meet regulatory requirements, and support regional growth

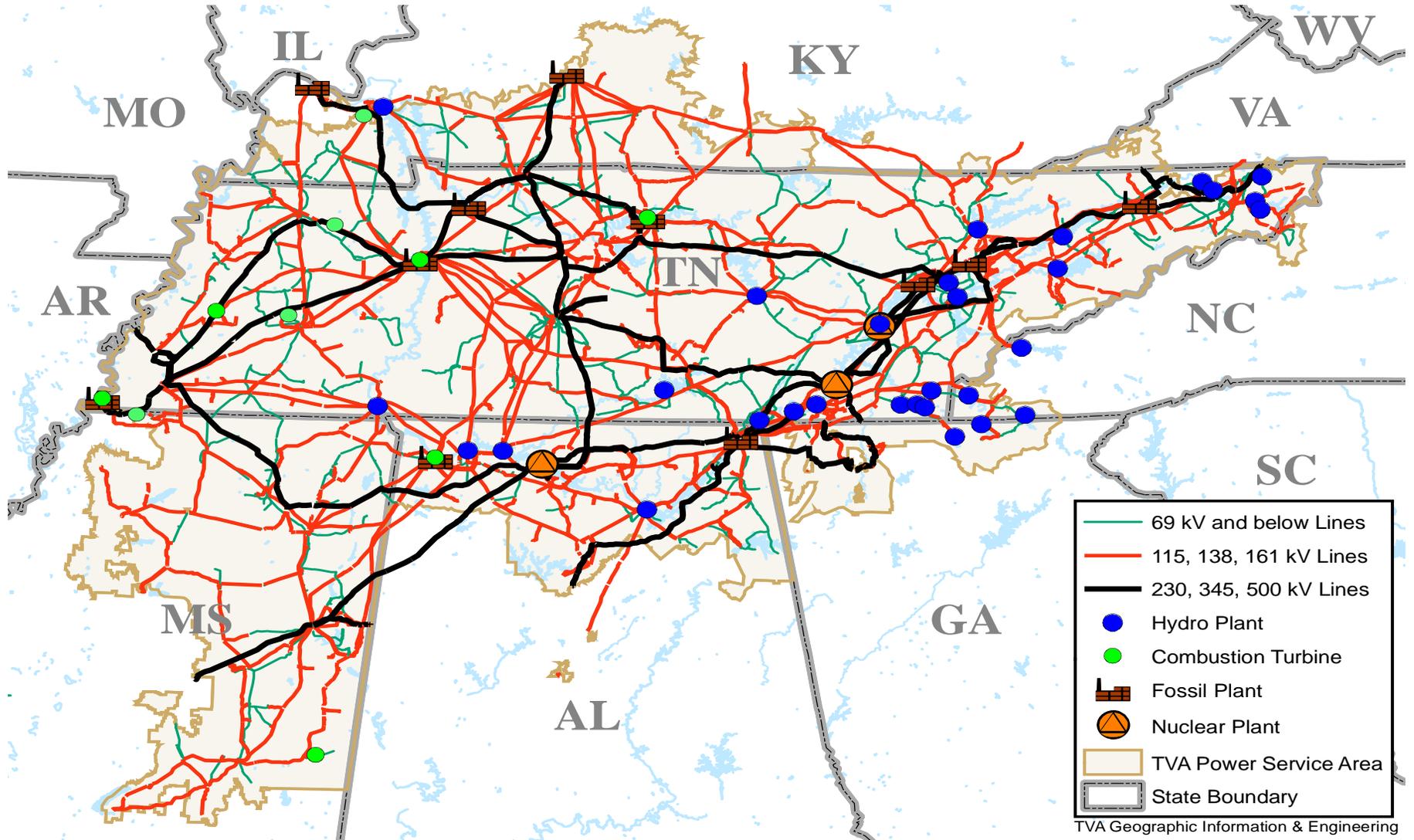
- ◆ TVA measures Reliability by:
 - Load Not Served (LNS)
 - Connection Point Interruptions (CPI)



System reliability is maintained through continual work to repair/ replace/ upgrade system elements



TVA's Integrated System



TVA Transmission at a Glance



- ◆ **16,000+** circuit miles of line operated at 115-kV to 500-kV
- ◆ **500+** substations and switchyards (100-kV and above)
- ◆ **103,000+** transmission structures on **237,000** right-of-way acres
- ◆ **1,200+** customer connection points
- ◆ **2** fully-operational Control Centers

TVA Generation Assets

	<u>Plants/Units</u>	<u>First/Last in Service</u>	<u>Capacity*</u> (MW)	<u>Capacity/Energy**</u> (percent)
 Hydro	30/113	1912/1978	5,433	15/12
 Coal	10/46	1951/1973	12,901	35/40
 Nuclear	3/6	1974/1996	6,724	19/33
 Gas CT/CC	13/98	1971/2012	9,242	25/10
 Other	• Contractual/ PPAs	• Diesels	• Renewable	2,294
				6/4

* Summer Net Capability as of 09/30/2013

** Based on FY13 Energy Totals



System Operations: Keeping the Lights On

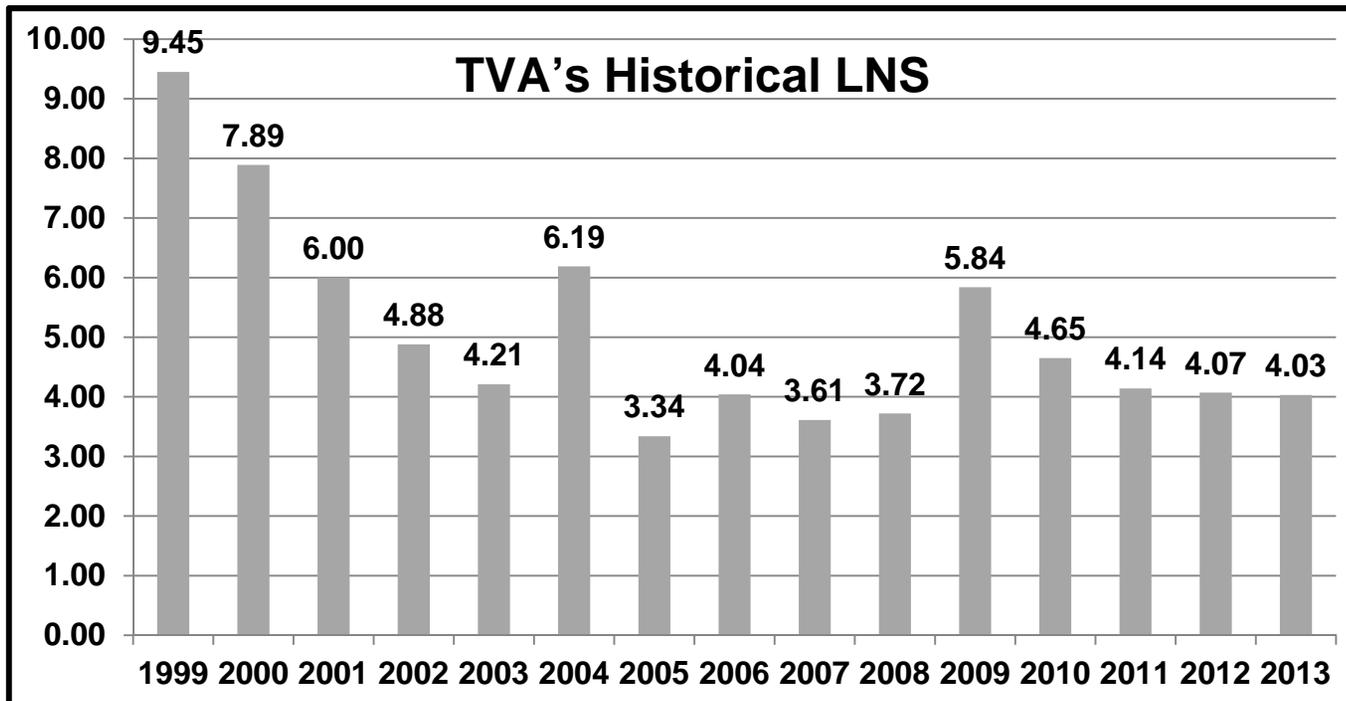
- ◆ System Operations Center: Nerve center of TVA
- ◆ 24 x 7 operations
- ◆ Real-Time monitoring of the TVA Transmission System
- ◆ System Operations Center fully backed up by the Regional Operations Center
- ◆ Critical systems can be executed independently
- ◆ Continuous balancing of load and generation





TVA Reliability: Duration of Outages

- ◆ TVA's current performance is within first quartile industry performance
- ◆ 99.999% reliability = 7.8 system minutes of Load Not Served (LNS)
- ◆ Issues putting 99.999% at risk:
 - Aging Assets
 - Tightening Regulations
 - Changing System Conditions



For 14 years, the TVA system has been 99.999% reliable

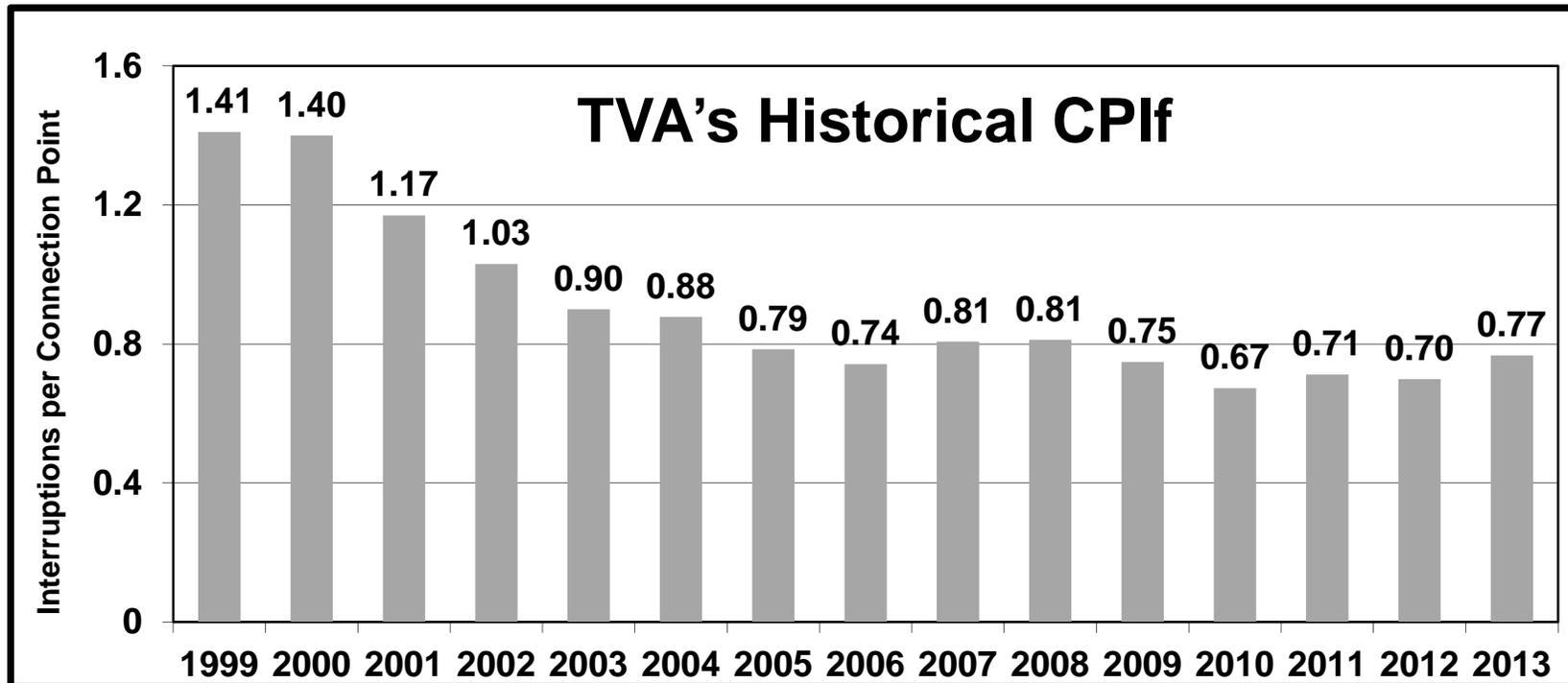


TVA Reliability: Frequency of Outages

- ◆ TVA's current performance is within first quartile industry performance for Connection Point Interruption Frequency (CPIf)
- ◆ Includes sustained and momentary interruptions
- ◆ Top impacts to frequency of customer interruptions:
 - Weather (Lightning and Wind)
 - Aging Assets
 - Foreign Objects (Birds, Animals, and Debris)

Since 2004*, TVA has been a Top Quartile performer or better

*2004 was the first year of an Industry Benchmarking being available with all voltage classes

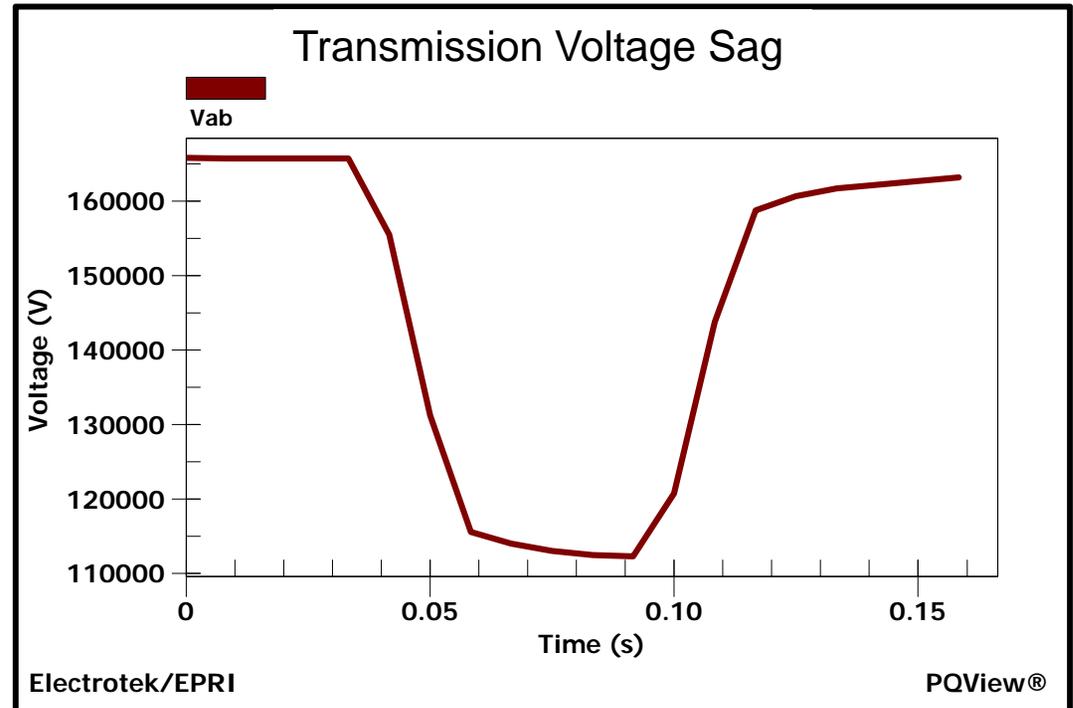




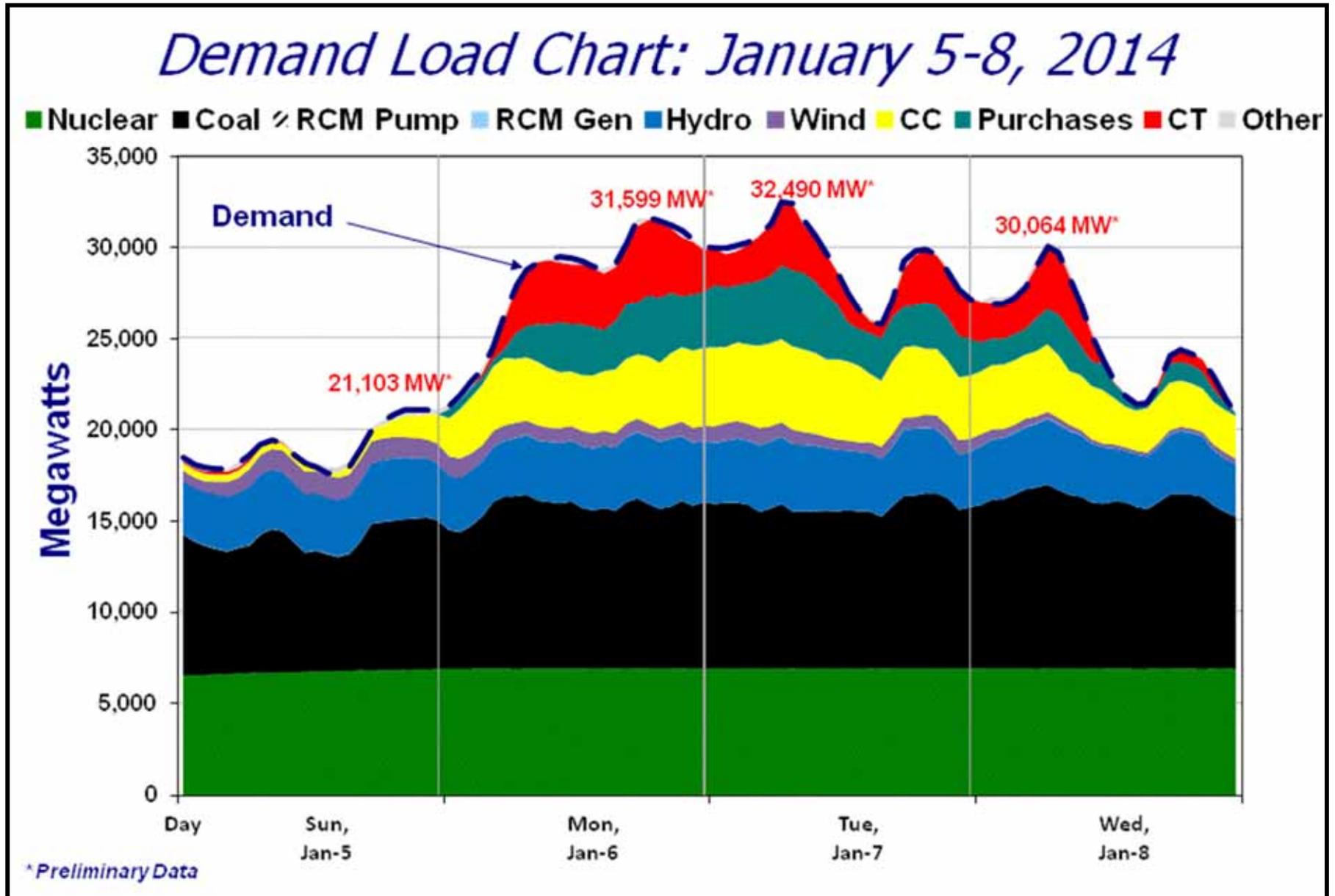
TVA Reliability: Consistency of Voltage

- ◆ Voltage sags can shut down sensitive production systems
 - Downtime costs for 50MW sensitive industry >\$100k in production losses
- ◆ TVA's PQ Program goal is reducing voltage sags associated with transmission system faults
- ◆ Program targeted at top 100 largest industries in the Valley:
 - Food Production
 - Textiles
 - Paper
 - Printing
 - Chemicals
 - Rubber
 - Plastics
 - Glass
 - Primary Metals
 - Electronics
 - Transportation

Power Quality program is focused on keeping the industry in the TN Valley running smoothly

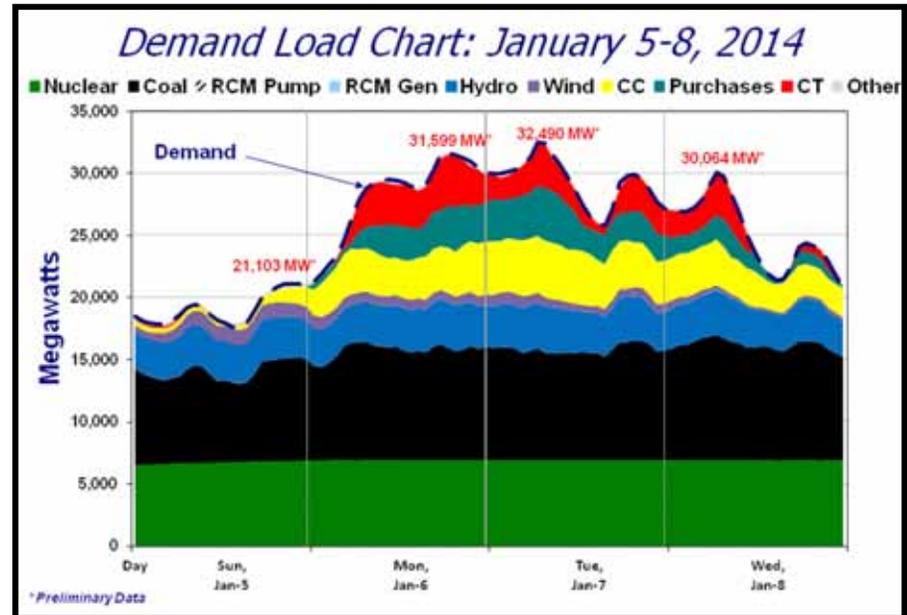


TVA Reliability: Matching Generation to Load

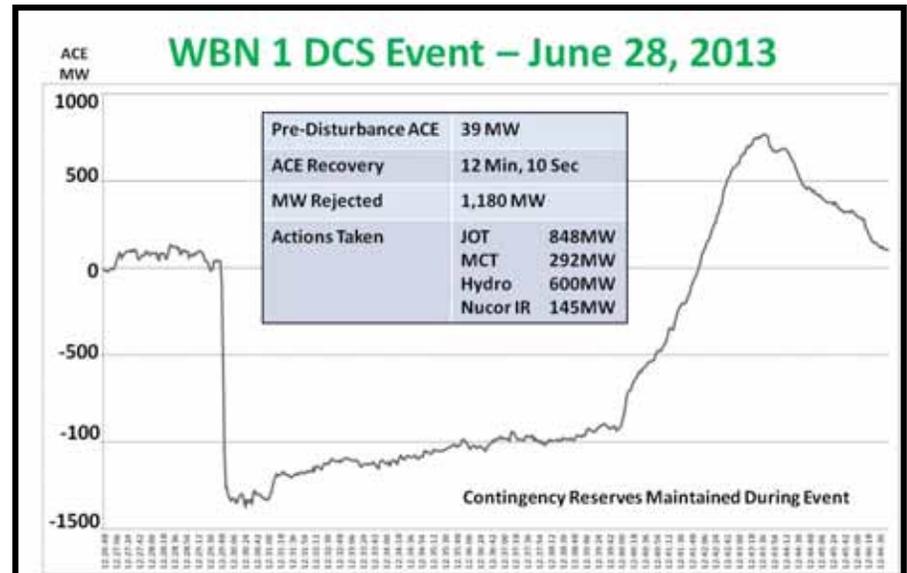


TVA Transmission: Connecting Generation to Load

- ◆ Real-Time balancing of generation (supply) and load (demand)
 - Generation includes native sources and purchases
 - Diverse plant types ramp at different rates
 - Changing generation mix can significantly impact ability to meet load requirements



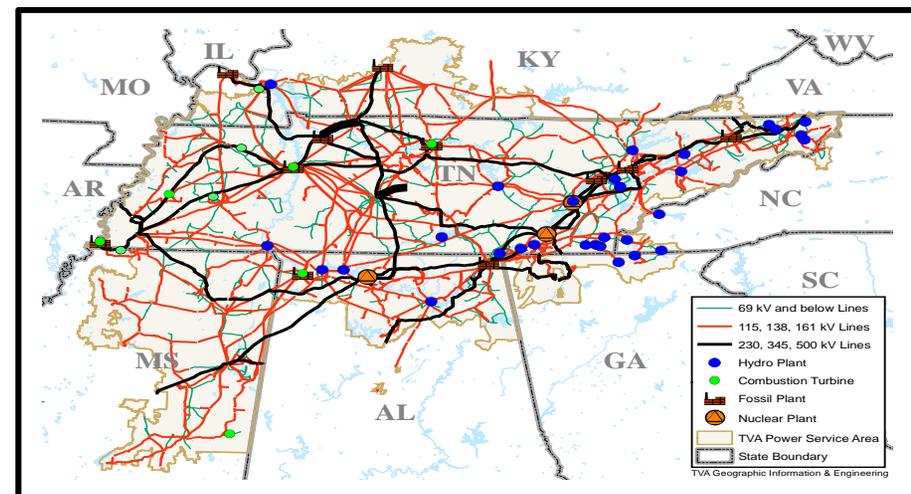
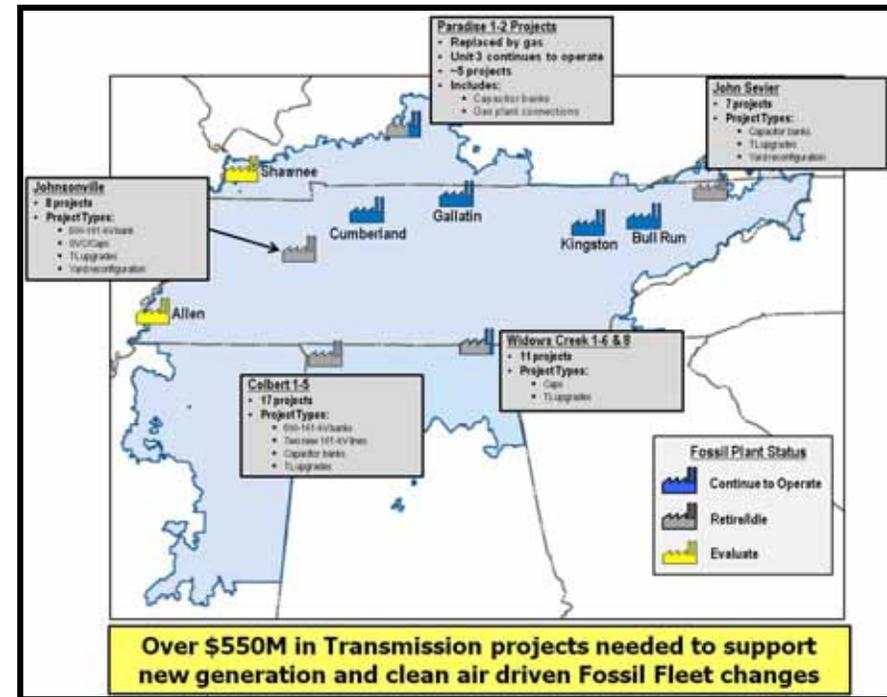
- ◆ Sufficient Reserves must be maintained at all times to recover from unexpected large generation losses



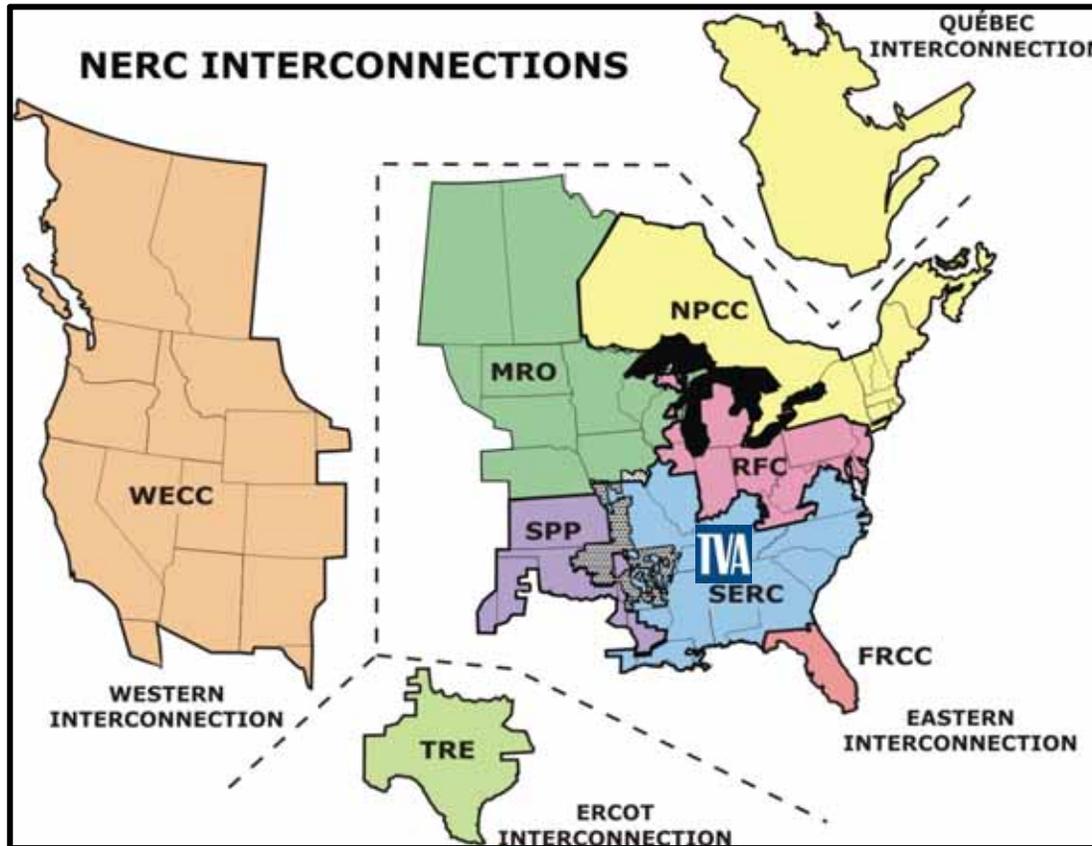
TVA Planning for System Resiliency

- ◆ Generation decisions cannot be made without Transmission support
 - Projects must be in place to ensure power can still be delivered where needed

- ◆ Robust Transmission system is needed to provide flexibility and respond to system events
 - Localized storm damage does not impact the entire system
 - Single generator loss can be balanced with power from another source



TVA Big Picture Reliability: Eastern Interconnection



- ◆ TVA is one of 23 Planning Authorities in the Eastern Interconnection
- ◆ TVA has 68 interconnections with 12 neighboring systems
- ◆ Partner with other industry participants to,
 - Prevent cascade of instabilities across neighboring systems (NE Blackout)
 - Plan robust and flexible systems
 - Guarantee resource adequacy

TVA partners with others to ensure the reliability of the Eastern Interconnection and the U.S.