NERC

NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Comments on Metric Proposals and RMWG's Responses

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Comments on Proposed Metrics and the RMWG's Responses

On June 1, 2010, the RMWG requested feedback from both the OC and PC on the 2010 metric proposals in its 2010 Annual Report.[1] The comments that the RMWG received, along with the responses to those comments are listed below. The revised metric templates based upon the comments received begin on page 9.

General Comments:

1. Kevin Koloini, American Municipal Power, Inc.

I think the date on pg. 44 (pg. 46 .pdf) should read 2010.

Agreed, the RMWG will make the correction.

I disagree with the proposal to revise the PRC standards to account for all equipment operations despite the benefit associated with the extra data. I believe the regulatory burden for tracking the operations will exceed the benefits. Is there an estimate for the number of operations?

Agreed, the RMWG plans to use the existing TADS outage information for all equipment operations.

The reporting associated with BAL-002 (35-80% disparities) should be able to be standardized, but I do not have any suggestions at this point.

The Resources Subcommittee and the proper standards drafting team will be able to address the reporting disparity.

I have some quality/discussion questions. Are the three Ts properly covered? Trees. Training. Tools. Is what has been proposed adequate benchmarking for ALR? Essentially, does this list of key performance indicators properly and clearly alert planners when reliability is decreasing?

As indicated in the RMWG's 2010 Annual Report (page 24), reliability metrics are linked not only to six characteristics of the ALR, but also to the eight Standards Objectives. It is within the RMWG's scope to develop key indicators to cover the three Ts. The metrics proposed so far have mainly been focused on the Reliability Planning and Operating Performance Objective. The RMWG will use the SMART ranking process to continue developing and refining the reliability metrics, and welcomes any specific proposals and improvement suggestions. Please submit your metric proposals to metrics@nerc.net.

[1] The RMWG's 2010 Annual Report is available at http://www.nerc.com/docs/pc/rmwg/RMWG_AnnualReport6.1.pdf.

Comments for ALR1-5:

1. Noman Williams, Sunflower Electric Power Corporation

I have provided the comments and metric rank based on my view of information provided and my view of importance, I have ranked High, Medium and Lower. Overall, these metrics can and I believe will provide some good information. Nice work by the RMWG.

ALR1-5 System Voltage Performance – High importance, with the increase of variable resources I believe this metric will be an important measure.

The RMWG appreciates the feedback.

2. MRO

Is "the Region" the appropriate applicable entity? Assuming that "the Region" is equivalent to the 8 NERC Regional Entities, we feel that the Reliability Coordinator would be a better option to gather and report the data since they readily collect and have the data. Additionally, Transmission Operators might be the appropriate Entity to specify the voltage bandwidths applicable at various select stations.

Agreed, the RMWG has worked with the Reliability Coordinators Working Group (RCWG) and plans to coordinate with all the entities involved, including the Transmission Operators, Reliability Coordinators, and the Regional Entities to ensure the applicable voltage bandwidths are specified and the options are evaluated on the appropriate data submitting and collecting entities.

3. Phil Fedora, NPCC

For clarity, suggest the metric specify the bus voltage to be recorded (for instance, positive sequence/RMS/per unit/phase-phase, etc.) and also specify the number of transmission system nodes bus voltages in order to provide an 'ball-park' indication of the number of buses expected to be followed by this metric. Also note that the location of these buses may change due to future system changes, making today's 'critical bus' less critical in the future, affecting comparisons between years. The requested one minute time increments should also be further defined to help narrow the scope of the intended activity (for example instantaneous, or averaged over the minute, or time-stamped, etc).

The metric specifies that the Region define the nodes for measurement and establish the acceptable bandwidth. These parameters are defined by each ISO/RTO within a Region, not by the Regional Entity - appropriate real-time voltage requirements and bandwidths depend on system conditions (line loadings, dispatch), voltage level monitored, and bus location that are administered by the responsible system operator. Many existing system control rooms currently

utilize advanced visualization of real time geographic system voltage profiles for enhanced awareness of their system voltage performance, which could be utilized for this metric.

The metric proposes that Regions would provide the data and results to NERC. The referred to SCADA or EMS data is provided to ISO/RTOs - a Regional Entity does not have access to real-time operational data such as this or choice of its monitoring points and is not set-up to be able to store such real-time information.

Therefore, it is suggested that the ISO/RTO system operators, not the specified TO's should be identified as the Data submitting Entity, and be required to report and archive the data, not the Regions.

A pilot program is essential, esp. if data validation is critical, given the potential volume of data that would be required. A common format for the collection and exchange of such information could be worked out during a trial period.

Considering voltage profiles absent understanding the corresponding underlying system conditions at the time (unexpected transmission/generation outage(s), switching events, tap changers, etc.) may lead to erroneous conclusions. Current initiatives, such as the wide-spread deployment of time-synchronized synchophasors may better address power system reliability and visibility through wide area voltage measurement in the future. There are several synchophasor initiatives in the Northeast that will be determining 'critical nodes' to monitor. The RMWG should consider the roles that existing control room voltage visualization and monitoring, and future synchophasor implementation play in the development of this metric.

Agreed, the metric template has been revised to clarify bus voltage specification, including positive-sequence, phase-to-phase RMS value, as shown in the Revised Metric Templates section below.

Regarding the data submitting and collecting entities, the RMWG has worked with the Reliability Coordinators Working Group (RCWG) and plans to coordinate with all the stakeholders involved, including the Transmission Operators, Reliability Coordinators, and the Regional Entities to ensure the applicable voltage bandwidths are specified and the options are evaluated on the appropriate data submitting and collecting entities.

The RWMG will start with a pilot run since validation of the metric data and trending results is critical. As suggested, the RMWG will consider existing control room visualization tools and future synchophasor implementation in the development of this metric.

Comments for ALR1-12:

1. Noman Williams, Sunflower Electric Power Corporation

ALR1-12 Interconnection Frequency Response - High importance

The RMWG appreciates the feedback.

2. MRO

Reporting this information on a national level may be too broad. We suggest reporting this data on a specific interconnection basis since definitions of response are different. How do we know the data from 1999 is valid or good data?

Agreed, the metric will be reported on an interconnection level. The RMWG is working with the Resources Subcommittee (RS), the standard drafting team and NERC staff to ensure the metric data is validated and trending is presented properly.

3. Phil Fedora, NPCC

The RMWG should consider the on-going NERC Events Analysis and/or the Frequency Response initiative(s) as the 'Linkage to Data Source.' System frequency response is a function of the real-time dispatch at the time of the disturbance, and the specific system conditions (unit commitment, real-time reserves, etc.) at that time of the event – the referenced 'Resource Adequacy Application' is more applicable to long-term planning.

Agreed, The RMWG is taking advantage of current NERC Frequency Response Initiative and working with the Resources Subcommittee, the standard drafting team and NERC staff to ensure the metric data is validated and trending is presented properly. The referenced "Resource Adequacy Application" is a real-time resource/load balancing visualization tool used by the Reliability Coordinators and NERC.

4. Kevin Koloini, American Municipal Power, Inc.

I felt the Interconnection Frequency Response formula had a lower SMART rating than it should have, but I did not see the reasoning behind it.

The RMWG applies the SMART rating[2] to create a metric priority list. Since understanding the frequency response and identifying its root causes of continued decline are complex technical subjects, the overall SMART score for this metric is lower. In addition, historically the frequency response data has been collected by industry volunteers and not been fully validated.

Comments for ALR2-3:

1. Noman Williams, Sunflower Electric Power Corporation

ALR2-3 Activation of Under Frequency or Under Voltage Load Shedding – Lower importance

[2] Details of SMART rating are available at http://www.nerc.com/docs/pc/rmwg/RMWG_Metric_Report-09-08-09.pdf.

Not sure exactly what information and reliability indication this metric provides in the absence of cause and frequency level

The RMWG plans to conduct a pilot run to evaluate whether activation of UFLS has increased over time and any interactions existed between UFLS actions at various locations.

2. Phil Fedora, NPCC

Having this activity based on what is reported per PRC-020 and PRC-006 would require access to confidential compliance information. Agree a pilot program and validation would be required; it would demonstrate what would be needed to obtain the referenced pilot data for the last 10 yrs (1999-2009). NPCC suggests that UFLS and UVLS be separated into two separate metrics as these programs are designed for different purposes. Each has its own respective NERC Standard and therefore it is recommended it would be better for each to have its own separate, specific metric.

Agreed, the RMWG has separated the UFLS and UVLS from this metric. The current ALR2-3 will only focus on activation of UFLS, as shown in the Revised Metric Templates section below.

Comments for ALR6-11:

1. Noman Williams, Sunflower Electric Power Corporation

ALR6-11 Automatic AC Transmission Outages Initiated by Failed Protection System Equipment – Medium importance, good information but it may be incomplete or not provide the industry a usable data set of the type, style and age of equipment the failed is not provided

The RMWG will monitor the metric trends. If the automatic outages tend to increase over time due to the failed protection system equipment, the RMWG will work with all involved stakeholders, including the TADSWG (Transmission Availability Data System Working Group) and SPCS (System Protection and Control Subcommittee) to assess the situation. The detailed equipment type, style and other specifications may be provided to proper entities via lessons learned and other communication vehicles.

2. Phil Fedora, NPCC

Agree that TADS data and not the misoperation data reported through compliance with the appropriate NERC Standards should be used for ALR6-11-15. Note that 2010 will be first year of TADS data collection that includes non-automatic outages reporting.

The RMWG appreciates the feedback.

3. SPCS (System Protection and Control Subcommittee)

"Automatic AC Transmission Outages Initiated by Failed Protection System Equipment" is not an accurate description of the information reported in metric ALR6-11. The title of the metric should reflect the data reported in TADS under the Automatic Outage Cause Code, *Failed Protection System Equipment*. Despite the name of the code, this code includes all protection system misoperations that are not related to human error. We recommend that the title of this metric should be changed to "Automatic AC Transmission Outages Initiated by Protection System Equipment-Related Misoperations" and that a footnote or text box should be added to indicate that this metric includes protection system equipment-related problems such as equipment failure, relay setting drifting, and internal relay logic or algorithm errors, and excludes misoperation causes such as miscoordinated settings, incorrect setting calculations, and errors in applying settings to the relay which are classified in TADS under human errors.

The RMWG has discussed the SPCS's recommendations with the TADSWG (Transmission Availability Data System Working Group). As indicated in the metric template, the Failed Protection System Equipment has been one of the cause codes defined in TADS since 2008. The RMWG and TADSWG have agreed to use the TADS terminology and data for use in metrics ALR6-11 through6-16 and not to deviate from TADS at this time. The suggested footnote has been added in the metric template, as shown in the Revised Metric Templates section below.

Comments for ALR6-12:

1. Noman Williams, Sunflower Electric Power Corporation

ALR6-12 Automatic AC Transmission Outages Initiated by Human Error – Medium importance, good for trending.

The RMWG appreciates the feedback.

2. MRO

The TADS definition for Human error may be too broad. If an outage occurs due to incorrect settings by the relay engineer or field personnel, would this outage be included?

Agreed, the RMWG has worked with the SPCS and the TADSWG. Per the SPCS's recommendations, a clarification has been added in the metric template. Yes, the incorrect settings by the relay engineer or field personnel are counted as the Human Error in TADS and in this metric.

3. SPCS (System Protection and Control Subcommittee)

We recommend misoperation causes such as miscoordinated settings, incorrect setting calculations, and errors in applying settings to the relay be classified in TADS under human errors.

A footnote or text box should be added for ALR6-12 to indicate that this metric includes protection system misoperations due to human error such as miscoordinated settings, incorrect setting calculations, and errors in applying settings to the relay, in addition to the other human errors identified in the TADS Data Reporting Instruction Manual for the Automatic Outage Cause Code, *Human Error*.

Agreed, the note has been added in the metric template, as shown in the Revised Metric Templates section below.

Comments for ALR6-13 and ALR6-14:

1. Noman Williams, Sunflower Electric Power Corporation

ALR6-13 Automatic AC Transmission Outages Initiated by Failed AC Substation Equipment – Medium importance, good information but it may be incomplete or not provide the industry a usable data set of the type, style and age of equipment the failed is not provided. Good for trending but will need to have some idea if specific device have higher or upward trend in failures to gauge of there are issues or concerns.

Agreed, the RMWG will monitor the metric trends. If the automatic outages tend to increase over time due to the failed AC substation equipment, the RMWG will work with all involved stakeholders, including the TADSWG (Transmission Availability Data System Working Group) to assess the situation. The detailed equipment type, style and other specifications may be provided to proper entities via lessons learned and other communication vehicles.

2. MRO

Does the metric exclude weather related events? Upward trending outages due to weather are a good thing; we want weather-related outages to clear and reclose. Temporary faults due to lightning, high wind, debris, etc should be excluded.

The metric excludes all weather related events. The weather is a separate TADS cause code. Only the automatic outages initiated by the failed AC substation equipment are considered.

Comments for ALR6-15 and ALR6-16:

1. Noman Williams, Sunflower Electric Power Corporation

ALR6-15 Element Availability Percentage (APC) – High importance, interesting trend information, maybe useful to also provide metric information for each reliability region

The RMWG appreciates the feedback.

2. MRO

What is the definition of "sustained"? Different utilities could have different definitions; different minimum thresholds.

Does the metric exclude weather related events?

We suggest defining non-automatic to exclude planned outages as a planned outage to rebuild a line or to double circuit with a new line will be scheduled to not impact reliability.

What separates this metric from ALR6-15?

The RMWG and TADSWG have agreed to use the TADS terminology and data for use in metrics ALR6-11 through 6-16. The definition of "sustained" is available in the TADS definition document.[3]

The metric Element Availability Percentage (APC) uses the TADS data and does not exclude the weather related events. The Element Availability Percentage (APC) calculation is described in the TADS reports.[4]

ALR6-16 will not include the planned outage. Only the unavailability due to forced outages will be considered.

[3] TADS definitions are available at http://www.nerc.com/docs/pc/tadswg/TADS_Definitions_Appendix_7_092909.pdf.

[4] Detailed APC calculation is available at http://www.nerc.com/docs/pc/tadstf/TADS_Phase_II_Final_Report_091108.pdf.

Revised Metric Templates Based on the Comments Received

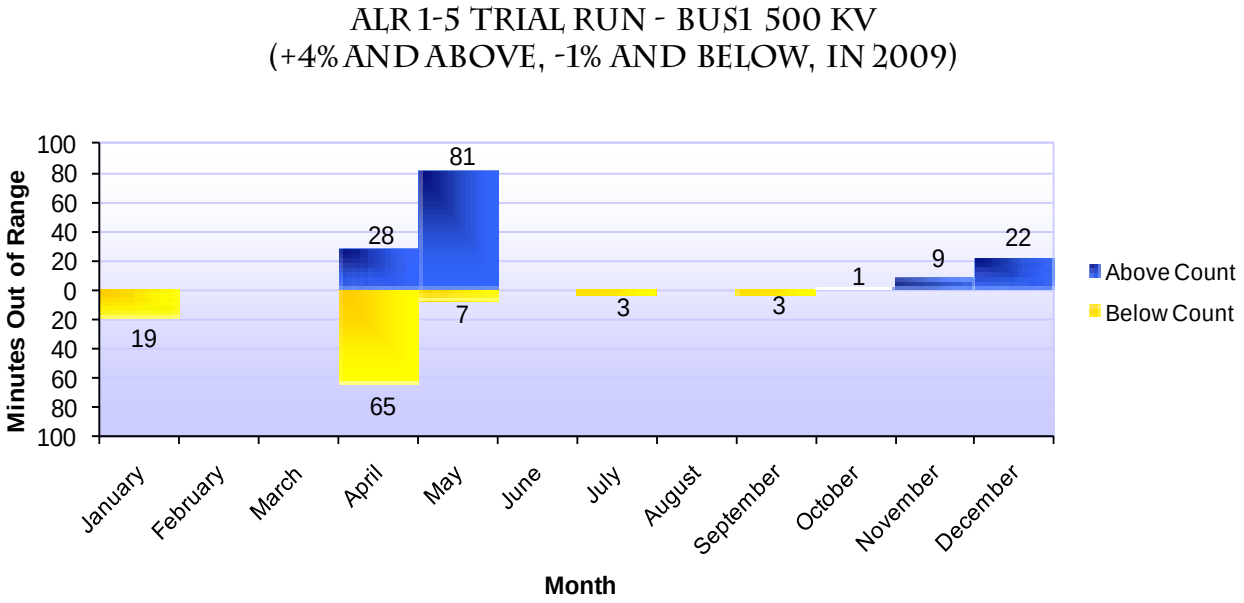
ALR1-5 System Voltage Performance	
Metric Number	ALR1-5
Submittal Date	May 8,2009
Sponsor Group	RMWG
Short Title	Transmission System Voltage Profile
Metric Description	Measure the transmission system voltage performance over time
Purpose	Measure the transmission system voltage performance (either absolute or per unit of a nominal value) over time which provides an indication of the reactive capability applied to the transmission system. Record the amount of time that system voltage is outside a predetermined band around nominal.
How will it be suited to indicate performance?	Measuring the transmission system voltage level over time provides an indication of the capability of reactive resources (both static and dynamic) applied to the transmission system. Wide fluctuations in voltage levels during off peak to on peak load cycles may indicate inadequate reactive resources necessary to maintain stable voltage profiles.
Formula	At select transmission system nodes (e.g., busses), record one-minute average node (bus) voltage for positive sequence, phase-to-phase RMS (root-mean-square) value. Record the number of minutes the actual voltage level is outside a predetermined range around nominal. Guidance would be necessary to establish a measurement process. It would be done at a Region level. The Region would define the nodes for measurement and establish the acceptable bandwidth. The Regions would provide the data and results to NERC.
Time Horizon	Real time, operating horizon
Metric Start Time or Baseline	Start when the guidance document has been developed and data is first available
Data Collection Interval and Roll Up	Voltage readings recorded in one minute intervals. Graphs plotted with voltage vs. time for each bus monitored. Number of minute's voltage outside the predetermined range of nominal totaled per reporting period. This would be further developed and documented by Regions.
Ease of Collection	RMWG will work with all the entities involved, including the Transmission Operators, Reliability Coordinators, and the Regional Entities to ensure the applicable voltage bandwidths are specified and critical nodes (busses) are designated to monitor. Data will be collected through EMS and/or SCADA system readings and archived for reporting on a monthly basis.
Aggregation	Total minutes node (bus) voltage is outside the range of nominal is aggregated per node (bus) and by voltage class. No aggregation possible for actual node (bus) voltage, but critical nodes (busses) can be identified that provide maximum indication of system voltage performance.
Linkage to NERC Standard	VAR-001
Linkage to Data Source	EMS and/or SCADA system data readily available. Recording and storage system may be required but should be available.

Need for Validation or Pilot	Data pilot and validation are required. Questionnaires were sent to RCWG to define number of busses and specific bandwidths.
Data Submitting Entity	RMWG will work with all the entities involved, including the Transmission Operators, Reliability Coordinators, and the Regional Entities to ensure the applicable voltage bandwidths are specified and the options are evaluated on the appropriate data submitting and collecting entities.

SMART Rating	Total Score	Specific/ Simple	Measurable	Attainable	Relevant	Tangible/ Timely
	14	3	3	3	3	2

Reporting	
Style (look and feel)	Line graphs of actual values or deviations from nominal. Bar charts for total time outside a range of nominal.
Publications and Documentation	This metric will be included in NERC RMWG reports

Sample Chart

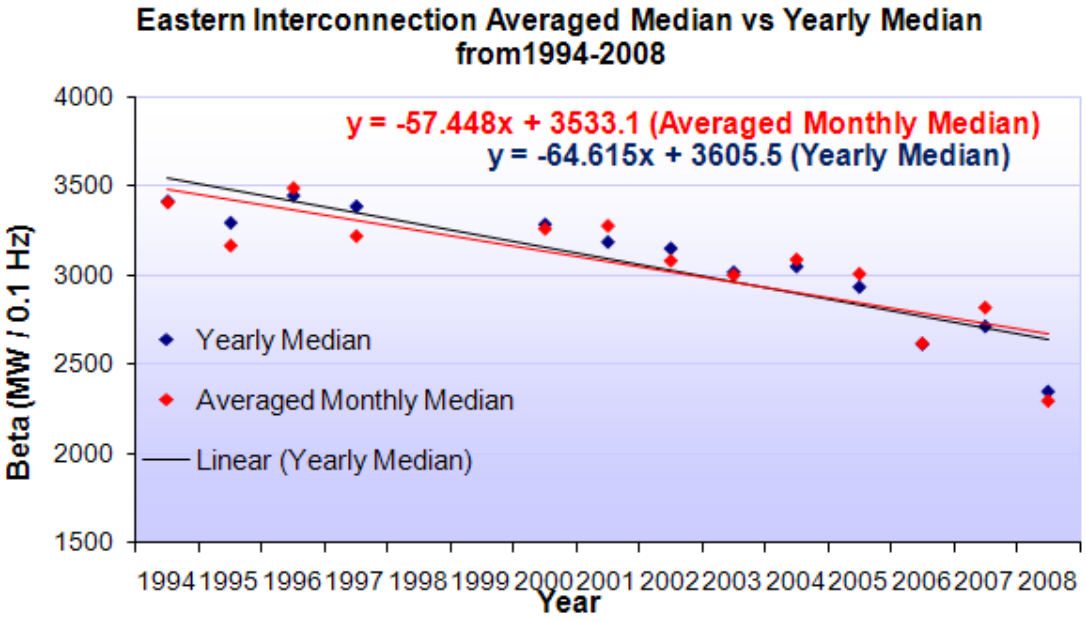


ALR1-12 Interconnection Frequency Response						
Metric Number	ALR1-12					
Submittal Date	June 18, 2009					
Sponsor Group (OC, PC or subgroup name)	Resources Subcommittee					
Short Title	Interconnection Frequency Response					
Metric Description	The metric is to track and monitor Interconnection Frequency Response.					
Purpose	There is evidence of continuing decline in Frequency Response in the three Interconnections over the past 10 years, but no confirmed reason for the apparent decline. The metric data trends and analysis will assist in identifying root causes of decline.					
How will it be suited to indicate performance?	Frequency Response is a measure of an Interconnection's ability to stabilize frequency immediately following the sudden loss of generation or load. It is a critical component to the reliable operation of the bulk power system, particularly during disturbances and restoration.					
Formula	Average frequency responses for all events where frequency drops more than 35 MHz within a year					
Time Horizon	Historic view					
Metric Start Time or Baseline	1999 or when data is first available					
Data Collection Interval and Roll Up	Quarterly					
Ease of Collection	Available from ARR report[5]					
Aggregation	Interconnection					
Linkage to NERC Standard	BAL-003					
Linkage to Data Source	Resource Adequacy Application					
Need for Validation or Pilot	No					
Data Submitting Entity	Balancing Authorities					
SMART Rating	Total Score	Specific/ Simple	Measurable	Attainable	Relevant	Tangible/ Timely
	11	2	2	2	3	2
Reporting						

[5] The CERTS/EPG Automatic Reliability Report (ARR) application provides a summary of load-generation, resource adequacy and control performance for the three NERC interconnections (Eastern, Western, and ERCOT).

Style (look and feel)	Line graphs of actual values or deviations from nominal.
Publications and Documentation	This metric will be included in NERC RMWG reports

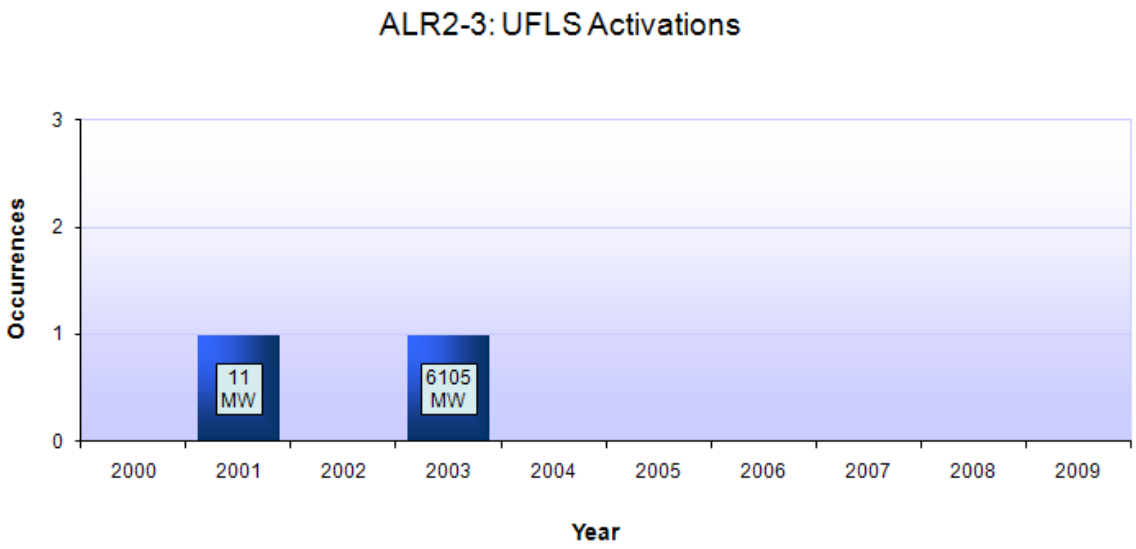
Sample Chart



Source: The EI raw frequency event data has been collected by individual volunteers over time and was obtained more readily when unit loss events were freely shared among system operators.

ALR2-3 Activation of Under Frequency Load Shedding						
Metric Number	ALR2-3					
Submittal Date	May 8, 2009					
Sponsor Group (OC, PC or subgroup name)	RMWG					
Short Title	UFLS Activation					
Metric Description	Number of activation of UFLS by each region and total MW of load interruption by each region and NERC wide.					
Purpose	The purpose of the Under Frequency Load Shedding (UFLS) is mitigation for when the System does not perform in an acceptable manner after a credible Contingency.					
How will it be suited to indicate performance?	By utilizing a known standard and the value of success, the industry can focus on technically based and practical application based perspective on both reliability metric and operational planning.					
Formula	Number of activation of UFLS by each region and total MW of load interruption by each region and NERC wide.					
Metric Start Time or Baseline	Start with pilot data for last 10 year (1999 – 2009)					
Time Horizon	Operations					
Data Collection Interval and Roll Up	Yearly					
Ease of Collection	Data is available in Regional Entities per PRC-006.					
Aggregation	At regional level					
Linkage to NERC Standard	PRC-006					
Linkage to Data Source	UFLS database at each region					
Need for Validation or Pilot	Data pilot and validation are required.					
Data Submitting Entity	Regional Entities					
SMART Rating	Total Score 10	Specific/ Simple 3	Measurable 2	Attainable 1	Relevant 2	Tangible /Timely 2
Reporting						
Style (look and feel)	Line or bar chart					
Publications and Documentation	RMWG annual report and Reliability Indicators webpage					

Sample Chart



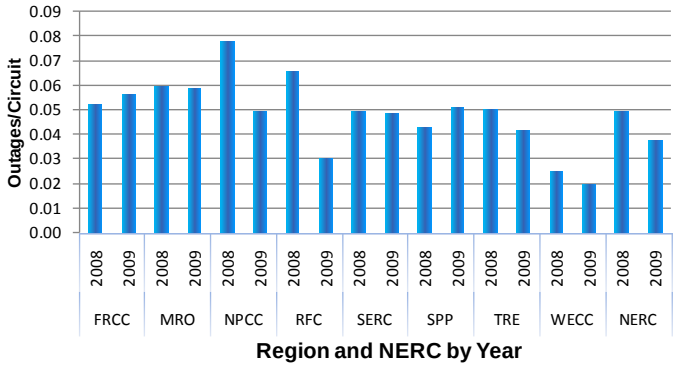
ALR6-11 Automatic AC Transmission Outages Initiated by Failed Protection System Equipment	
Metric Number	ALR6-11
Submittal Date	March 31, 2010
Sponsor Group (OC, PC or subgroup name)	NERC
Short Title	AC Transmission Outages - Failed Protection System Equipment
Metric Description	Normalized count (on a per circuit basis) of 200kV and above AC Transmission Element outages (i.e. TADS momentary and sustained Automatic Outages) that were initiated by Failed Protection System Equipment. This metric will use the TADS data and definition of *Failed Protection System Equipment. Transmission Elements* in this metric includes AC Circuits and Transformers. This metric includes protection system equipment-related problems such as equipment failure, relay setting drifting, and internal relay logic or algorithm errors, and excludes misoperation causes such as miscoordinated settings, incorrect setting calculations, and errors in applying settings to the relay which are classified in TADS under human errors.
Purpose	The purpose of this metric is to gauge Failed Protection System Equipment as one of many factors in the performance of AC transmission system Automatic Outages.
How will it be suited to indicate performance?	The normalized count provides an indication of the relative protection system equipment performance, specifically the AC Transmission Element outage rate for momentary and sustained outages initiated by Failed Protection System Equipment. Failed Protection System Equipment is one of the highest causes for initiating automatic transmission system outages.
Formula	Automatic AC Outages initiated by Failed Protection System Equipment = Number of Momentary and Sustained Automatic AC Element Outages initiated by Failed Protection System Equipment / Total Number of AC Elements (AC Circuits or Transformers). For example on a NERC-wide basis the 2008 calculation = 182 / (6653 AC Circuits) = 0.0274 outages per circuit. (Preliminary 2009 calculation = 154 / (6805.7 AC Circuits) = 0.0226 outages per circuit).
Metric Start Time or Baseline	Year 2008 and 2009 TADS data initially and eventually on a 5 year rolling average.
Time Horizon	Historical time frame
Data Collection Interval and Roll Up	The TADS data provides the total number of automatic transmission system outages and the number of outages initiated by failed protection system equipment[6] for 200 kV and above.
Ease of Collection	Data is already being collected via the NERC TADS process.
Aggregation	Results could be presented by normalized counts on a Regional Entity basis, Interconnection basis, or NERC wide basis.

[6] TADS Data Reporting Instruction Manual can be viewed at http://www.nerc.com/docs/pc/tadstf/Ph_I_Data_Reporting_Instr_Manual_112108.pdf.

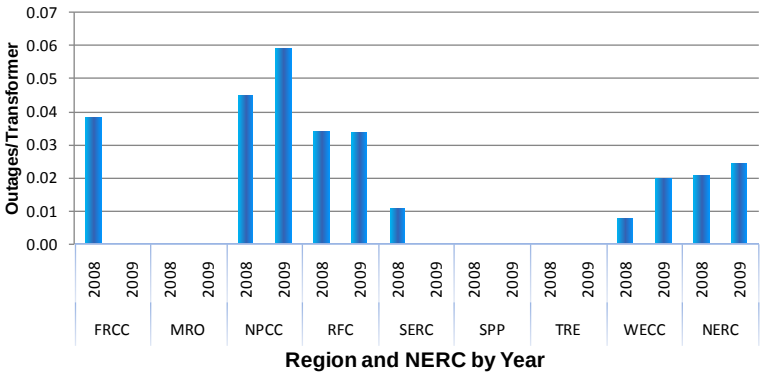
Linkage to NERC Standard	None					
Linkage to Data Source	The NERC TADS definitions and data.					
Need for Validation or Pilot	No, the data and results are already being reported via the TADS process.					
Data Submitting Entity	Transmission Owners via TADS procedures.					
SMART Rating	Total Score 14	Specific/ Simple 3	Measurable 3	Attainable 3	Relevant 3	Tangible/ Timely 2
Reporting						
Style (look and feel)	Bar charts					
Publications and Documentation	The statistics needed to compute this ALR metric are currently shown in the TADS reports. This metric may be included in the annual NERC LTRA report, at the discretion of the NERC Planning Committee.					

Sample Chart

ALR6-11 Automatic AC Circuit Outages Initiated by Failed Protection System Equipment



ALR6-11 Automatic Transformer Outages Initiated by Failed Protection System Equipment



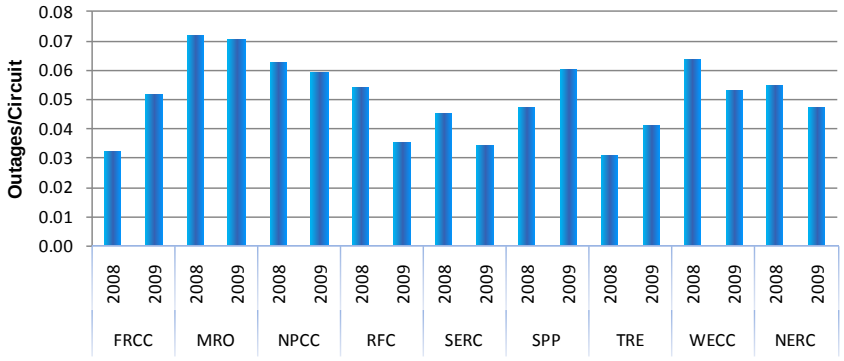
ALR6-12 Automatic AC Transmission Outages Initiated by Human Error	
Metric Number	ALR6-12
Submittal Date	March 31, 2010
Sponsor Group (OC, PC or subgroup name)	NERC
Short Title	AC Transmission Outages - Human Error
Metric Description	Normalized count (on a per circuit basis) of 200kV and above AC Transmission Element outages (i.e. TADS momentary and sustained Automatic Outages) that were initiated by Human Error. This metric will use the TADS definition of *Human Error*, which states "Automatic Outages caused by any incorrect action traceable to employees and/or contractors for companies operating, maintaining, and/or providing assistance to the Transmission Owner will be identified and reported in this category. Also, any human failure or interpretation of standard industry practices and guidelines that cause an outage will be reported in this category." *Transmission Elements* in this metric includes AC Circuits and Transformers. This metric includes protection system misoperations due to human error such as miscoordinated settings, incorrect setting calculations, and errors in applying settings to the relay, in addition to the other human errors identified in the TADS Data Reporting Instruction Manual for the Automatic Outage Cause Code, Human Error.
Purpose	The purpose of this metric is to gauge Human Error as one of many factors in the performance of AC transmission system Automatic Outages.
How will it be suited to indicate performance?	The normalized count provides an indication of the relative human factor performance, specifically the AC Transmission Element outage rate for momentary and sustained outages initiated by Human Error. Human Error is one of the highest causes for initiating automatic transmission system outages.
Formula	Automatic AC Outages initiated by Human Error = Number of Momentary and Sustained AC Element Automatic Outages initiated by Human Error / Total Number of AC Elements [AC Circuits or Transformers]. For example on a NERC wide basis the 2008 calculation = 284 / (6653 AC Circuits) = 0.0427 outages per circuit. (Preliminary 2009 calculation = 234 / (6805.7 AC Circuits) = 0.0344 outages per circuit).
Metric Start Time or Baseline	Year 2008 and 2009 TADS data initially and eventually on a 5 year rolling average.
Time Horizon	Historical time frame
Data Collection Interval and Roll Up	The TADS data provides the total number of automatic transmission system outages and the number of outages initiated by Human Error[7] for 200 kV and above.
Ease of Collection	Data is already being collected via the NERC TADS process.
Aggregation	Results could be presented by normalized counts on a Regional Entity basis, Interconnection basis, or NERC wide basis.

[7] TADS Data Reporting Instruction Manual can be viewed at http://www.nerc.com/docs/pc/tadstf/Ph_I_Data_Reporting_Instr_Manual_112108.pdf.

Linkage to NERC Standard	None.					
Linkage to Data Source	The NERC TADS definitions and data.					
Need for Validation or Pilot	No, the data and results are already being reported via the TADS process.					
Data Submitting Entity	Transmission Owners via TADS procedures.					
SMART Rating	Total Score 14	Specific/ Simple 3	Measurable 3	Attainable 3	Relevant 3	Tangible/ Timely 2
Reporting						
Style (look and feel)	Bar charts					
Publications and Documentation	The statistics needed to compute this ALR metric are currently shown in the TADS reports. This metric may be included in the annual NERC LTRA report, at the discretion of the NERC Planning Committee.					

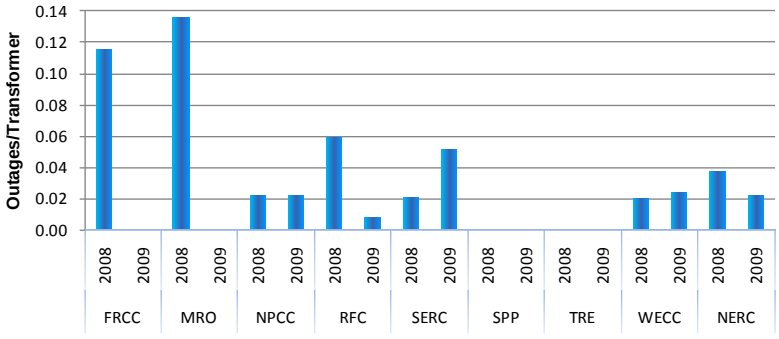
Sample Chart

ALR6-12 Automatic AC Circuit Outages Initiated by Human Error



Region and NERC by Year

ALR6-12 Automatic Transformer Outages Initiated by Human Error



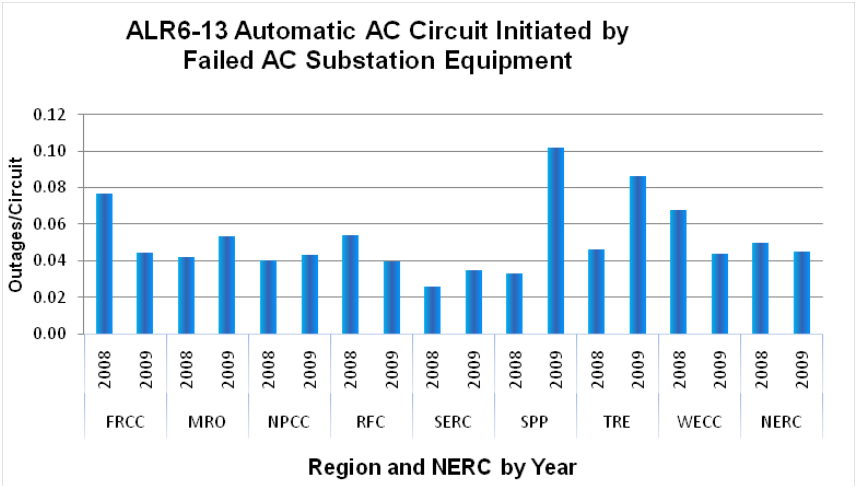
Region and NERC by Year

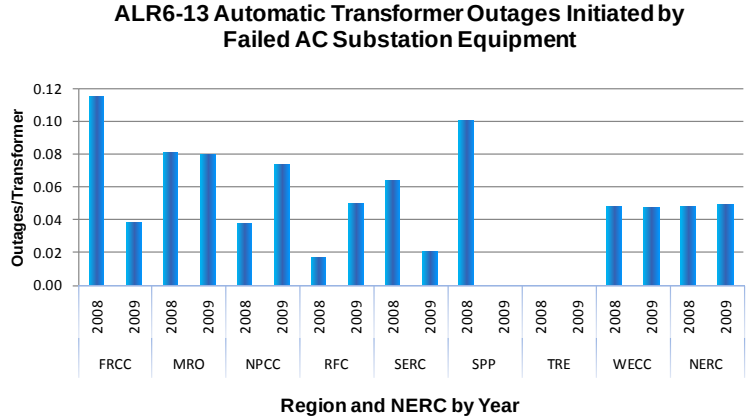
ALR6-13 Automatic AC Transmission Outages Initiated by Failed AC Substation Equipment	
Metric Number	ALR6-13
Submittal Date	March 31, 2010
Sponsor Group (OC, PC or subgroup name)	NERC
Short Title	AC Transmission Outages – Failed AC Substation Equipment
Metric Description	Normalized count (on a per circuit basis) of 200kV and above AC Transmission Element outages (i.e. TADS momentary and sustained Automatic Outages) that were initiated by failed AC substation equipment. This metric will use the TADS definition of "*Failed AC Substation Equipment*", which states "Automatic Outages caused by the failure of AC Substation; i.e., equipment "inside the substation fence" including Transformers and circuit breakers but excluding Protection System equipment. The TADS definition of "*AC Substation*" states "An AC Substation includes the circuit breakers and disconnect switches which define the boundaries of an AC Circuit, as well as other facilities such as surge arrestors, buses, transformers, wave traps, motorized devices, grounding switches, and shunt capacitors and reactors. Series compensation (capacitors and reactors) is part of the AC Substation if it is not part of the AC Circuit. See the explanation in the definition of "AC Circuit." Protection System equipment is excluded." *Transmission Elements* in this metric include AC Circuits and Transformers.
Purpose	The purpose of this metric is to gauge failed substation equipment as one of many factors in the performance of transmission system Automatic Outages.
How will it be suited to indicate performance?	The normalized count provides an indication of the relative substation equipment performance, specifically the AC Transmission Element outage rate for momentary and sustained outages initiated by AC substation equipment. AC substation equipment is one of the highest causes for initiating automatic transmission system outages.
Formula	Automatic AC Outages initiated by Failed AC Substation Equipment = Number of Momentary and Sustained Automatic AC Element Outages initiated by Failed AC Substation Equipment / Total Number of AC Elements (AC Circuits or Transformers). For example on a NERC-wide basis the 2008 calculation = 328 / (6605 AC Circuits) = 0.05 outages per circuit. (Preliminary 2009 calculation = 305 / (6756.7 AC Circuits) = 0.05 outages per circuit).
Metric Start Time or Baseline	Year 2008 and 2009 TADS data initially and eventually a 5 year rolling average.
Time Horizon	Historical time frame
Data Collection Interval and Roll Up	The TADS data provides the total number of automatic transmission system outages and the number of outages initiated by Failed AC Substation Equipment[8] for 200 kV and above.
Ease of Collection	Data is already being collected via the NERC TADS process.

[8] TADS Data Reporting Instruction Manual can be viewed at http://www.nerc.com/docs/pc/tadstf/Ph_I_Data_Reporting_Instr_Manual_112108.pdf.

Aggregation	Results could be presented by normalized counts on a Regional Entity basis, Interconnection basis, or NERC wide basis.					
Linkage to NERC Standard	None					
Linkage to Data Source	The NERC TADS definitions and data.					
Need for Validation or Pilot	No, the data and results are already being reported via the TADS process.					
Data Submitting Entity	Transmission Owners via TADS procedures.					
SMART Rating	Total Score	Specific/ Simple	Measurable	Attainable	Relevant	Tangible/ Timely
	14	3	3	3	3	2
Reporting						
Style (look and feel)	Bar charts					
Publications and Documentation	The statistics needed to compute this ALR metric are currently shown in the TADS reports. This metric may be included in the annual NERC LTRA report, at the discretion of the NERC Planning Committee.					

Sample Chart



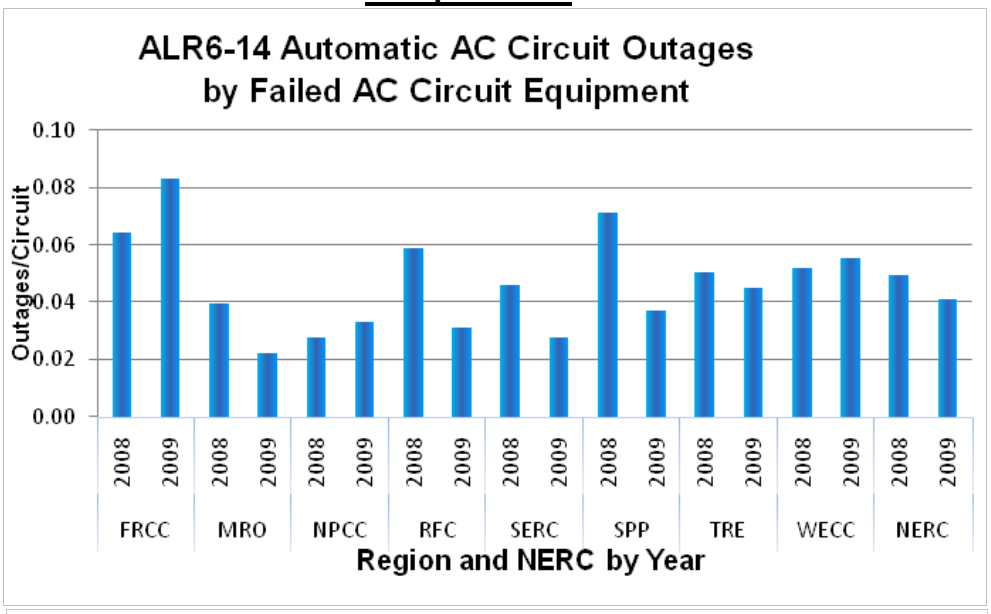


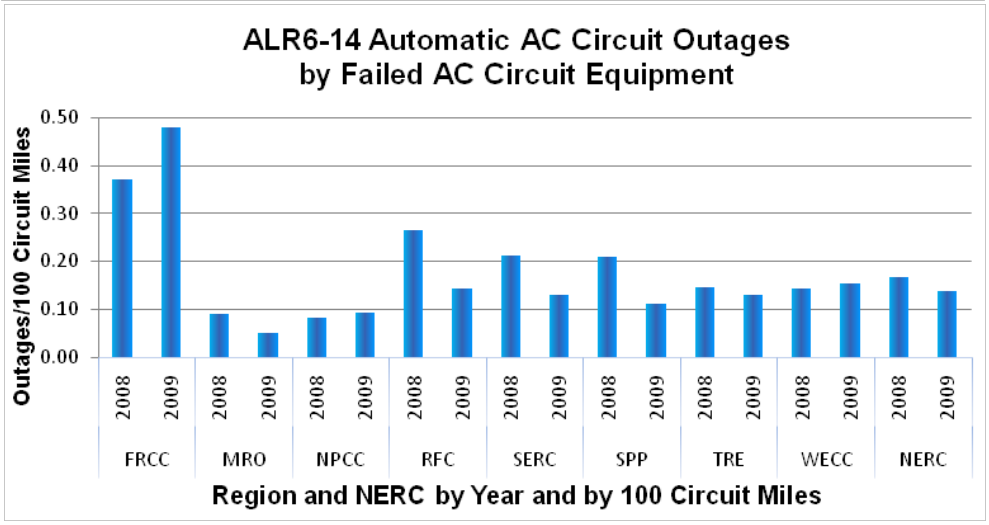
ALR6-14 Automatic AC Transmission Outages Initiated by Failed AC Circuit Equipment	
Metric Number	ALR6-14
Submittal Date	April 12, 2010
Sponsor Group (OC, PC or subgroup name)	NERC
Short Title	AC Transmission Outages – Failed AC Circuit Equipment
Metric Description	Normalized count (on a per 100 circuit-mile basis) of 200kV and above AC Transmission Element outages (i.e. TADS momentary and sustained Automatic Outages) that were initiated by failed AC circuit equipment. This metric will use the TADS definition of "*Failed AC Circuit Equipment*", which states "Automatic Outages related to the failure of AC Circuit equipment, i.e., overhead or underground equipment 'outside the substation fence.' Refer to the TADS definition of "*AC Circuit*", which states "A set of AC overhead or underground three-phase conductors that are bound by AC Substations. Radial circuits are AC Circuits." *Transmission Elements* in this metric include AC Circuits only.
Purpose	The purpose of this metric is to gauge failed AC circuit equipment as one of many factors in the performance of transmission system Automatic Outages.
How will it be suited to indicate performance?	The normalized count provides an indication of the relative transmission circuit equipment performance, specifically the AC Transmission Element outage rate for momentary and sustained outages initiated by AC circuit equipment. AC circuit equipment is one of the highest causes for initiating automatic transmission system outages.
Formula	Automatic AC Outages caused by Failed AC Circuit Equipment = Number of Momentary and Sustained Automatic AC Element Outages initiated by Failed AC Circuit Equipment / Total Number of AC Elements (AC Circuits or Transformers). For example on a NERC-wide basis the 2008 calculation = 326 / (6605 AC Circuits) = 0.05 outages per circuit. (Preliminary 2009 calculation = 277 / (6756.7 AC Circuits) = 0.04 outages per circuit).
Metric Start Time or Baseline	Year 2008 and 2009 TADS data initially and eventually a 5 year rolling average.
Time Horizon	Historical time frame
Data Collection Interval and Roll Up	The TADS data provides the total number of automatic transmission system outages and the number of outages initiated by Failed AC Circuit Equipment[9] for 200 kV and above.
Ease of Collection	Data is already being collected via the NERC TADS process.
Aggregation	Results could be presented by normalized counts on a Regional Entity basis, Interconnection basis, or NERC wide basis.
Linkage to NERC Standard	None

[9] TADS Data Reporting Instruction Manual can be viewed at http://www.nerc.com/docs/pc/tadstf/Ph_I_Data_Reporting_Instr_Manual_112108.pdf.

Linkage to Data Source	The NERC TADS definitions and data.					
Need for Validation or Pilot	No, the data and results are already being reported via the TADS process.					
Data Submitting Entity	Transmission Owners via TADS procedures.					
SMART Rating	Total Score	Specific/ Simple	Measurable	Attainable	Relevant	Tangible/ Timely
	14	3	3	3	3	2
Reporting						
Style (look and feel)	Bar charts					
Publications and Documentation	The statistics needed to compute this ALR metric are currently shown in the TADS reports. This metric may be included in the annual NERC LTRA report, at the discretion of the NERC Planning Committee.					

Sample Chart





ALR6-15 Element Availability Percentage (APC)	
Metric Number	ALR 6-15
Submittal Date	May 8, 2009
Sponsor Group (OC, PC or subgroup name)	SERC Reliability Corporation
Short Title	
Metric Description	Overall percent of time the aggregate of transmission system facilities (i.e., AC lines and transformers operated at 200 kV and above) are available for service. This includes outages caused by both automatic and non-automatic events. Momentary outages are not included in this calculation.
Purpose	To determine the percent of time that the transmission system operated at 200 kV and above is available when outages due to automatic and non-automatic events are considered. This value may be trended over time to gauge increasing or decreasing performance.
How will it be suited to indicate performance?	The overall availability is the percentage of time the transmission system is available (i.e., in service) for the transmission of electricity. The relative percentage provides an indication of the overall availability of the transmission system operated at 200 kV and above, which indicates reliability performance.
Formula	The percent of time the interconnected transmission system (AC circuits and transformers) operated at 200 kV and above is available due to sustained automatic and non-automatic outages, is calculated as follows: $$APC\ (\text{in } \%) = \left(1 - \frac{\text{Total Sustained Outage Hours}}{\text{Total Element Hours}}\right) \times 100$$ where, The APC, the Total Sustained Outage Hours and the Total Element Hours are defined and calculated in the TADS report[10].
Time Horizon	Historical perspective
Metric Start Time or Baseline and Roll Up	Year 2010, the first year of TADS data collection that includes Non-automatic outages
Data Collection Interval and Roll Up	Data collection is through the NERC TADS procedure. Metric calculation is one value for each Interconnection (Eastern, Western, Texas, and Québec) for the aggregate of facilities 200 kV and above. The metric would be reported on the same interval as TADS reports.

[10] The APC is defined on page 20 of the 2009 TADS Phase II Final Report, available at http://www.nerc.com/docs/pc/tadstf/TADS_Phase_II_Final_Report_091108.pdf.

Ease of Collection	The TADS database makes this metric easily reportable on a uniform basis.					
Aggregation	Reported on an aggregate basis by Regional Entity, Interconnection (Eastern, Western, Texas, and Québec) and NERC.					
Linkage to NERC Standard	None					
Linkage to Data Source	NERC TADS data base http://www.nerc.com/docs/pc/tadswg/Data_Reporting_Instr_Manual_09-29-09.pdf					
Need for Validation or Pilot	No, the data and results will be reported via the TADS process when it becomes available. [Note: The former ECAR, MAIN, and MAPP regions had collected and reported similar data and statistics in the past and could be used for reference.]					
Data Submitting Entity	Transmission Owner via TADS reporting procedure					
SMART Rating	Total Score	Specific/ Simple	Measurable	Attainable	Relevant	Tangible/ Timely
	13	3	3	3	2	2
Reporting						
Style (look and feel)	Bar charts, with possible trend lines added in the future					
Publications and Documentation	This metric is defined in TADS report as well and will be tracked in NERC metrics reports.					

Note sample charts will be available when non-automatic outages are entered in TADS.

ALR6-16 Transmission System Unavailability due to Automatic Outages	
Metric Number	ALR6-16
Submittal Date	May 8, 2009
Sponsor Group (OC, PC or subgroup name)	SERC Reliability Corporation
Short Title	Transmission System Unavailability due to Automatic Outages
Metric Description	Overall percent of time the aggregate of transmission system facilities (i.e., AC circuits and transformers 200 kV and above) are unavailable for service (out of service) due to sustained automatic outages. Planned outages are not included in this metric. Momentary outages would not be included in this calculation.
Purpose	To determine the percent of time that the transmission system operated at 200 kV and above is unavailable due to sustained automatic outages. This value may be trended over time to gauge increasing or decreasing performance.
How will it be suited to indicate performance?	The unavailability is the percentage of time the entire transmission system is not available (i.e., out of service) for the transmission of electricity due to sustained automatic outages. The relative percentage provides an indication of the overall unavailability of the transmission system operated at 200 kV and above, which indicates reliability performance.
Formula	The percent of time the interconnected transmission system (AC circuits and transformers) operated at 200 kV and above is unavailable due to sustained automatic outages is calculated as follows: $$\text{Unavailability (in \%)} = \frac{\text{Total hours out-of-service due to automatic outages}}{\text{Total facility-hours}} \times 100$$ where, Total facility-hours = hours in a year X number of facilities reported Total hours out-of-service = A summation of the hours out-of-service during the year for all of the facilities (i.e. AC circuits and transformers) Example: For a year with 365 days (or 8,760 hours) and a system with 90 facilities (AC circuits and transformers) that had 5,000 total facility-hours out-of-service due to sustained automatic outages, Total facility-hours = (8,760 hours in a year) X (90 facilities) = 788,400 $$\text{Unavailability} = \frac{5{,}000}{788{,}400} \times 100 = 0.63\%$$

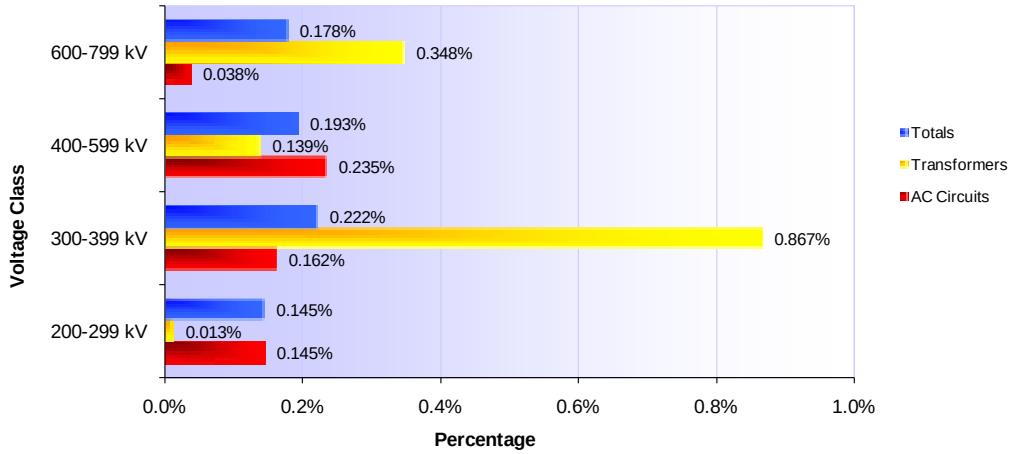
Time Horizon	Historical perspective
Metric Start Time or Baseline and Roll Up	Year 2008, the first year of TADS
Data Collection Interval and Roll Up	Data collection is through the NERC TADS procedure. Metric calculation is one value for each Interconnection (Eastern, Western, Texas, and Québec) for the aggregate of facilities 200 kV and above. The metric would be reported on the same interval as TADS reports.
Ease of Collection	The TADS database makes this metric easily reportable on a uniform basis.
Aggregation	Reported on an aggregate basis by Regional Entity, Interconnection (Eastern, Western, Texas, and Québec) and NERC.
Linkage to NERC Standard	None
Linkage to Data Source	NERC TADS database http://www.nerc.com/docs/pc/tadswg/Data_Reporting_Instr_Manual_09-29-09.pdf
Need for Validation or Pilot	No, the data and results are already being reported via the TADS process. [Note: The former ECAR, MAIN, and MAPP regions had collected and reported similar data and statistics in the past and could be used for reference.]
Data Submitting Entity	Transmission Owner via TADS reporting procedure

SMART Rating	Total Score	Specific/ Simple	Measurable	Attainable	Relevant	Tangible/ Timely
	13	3	3	3	2	2

Reporting	
Style (look and feel)	Bar charts, with possible trend lines added in the future
Publications and Documentation	This metric is recommended to be added to the NERC TADS report and included in NERC metrics reports.

Sample Chart

ALR 6-16: Transmission System Unavailability Due to Automatic Outages



Note: Phase shifters and transformers with low side voltage of 200 kV and above are included in the TADS inventory. The transformer outages are reported by high side voltage class in TADS.