Consideration of Comments on Underfrequency Load Shedding Characteristics

The Underfrequency Load Shedding Standard Drafting Team thanks all commenters who submitted comments on the UFLS Characteristics document. This document was posted for a 45-day public comment period from July 2, 2008 through August 15, 2008. The stakeholders were asked to provide feedback on the document through a special Electronic Standard Comment Form. There were 38 sets of comments, including comments from more than 100 different people from approximately 100 companies representing 8 of the 10 Industry Segments as shown in the table on the following pages.

http://www.nerc.com/filez/standards/Underfrequency_Load_Shedding.html

Based on stakeholder comments and the drafting team's consideration of those comments, the team has converted the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and will refine the proposed standard following the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.

The SDT made the following clarifications when converting the UFLS Reliability Standard Characteristics into proposed requirements:

- The responsibility for designing UFLS programs is assigned to groups of Planning Coordinators – each group of Planning Coordinators is expected to work cooperatively with other Planning Coordinators. (R1–R8)
- It is necessary to identify island(s) as a basis for designing the UFLS program, but not necessary to identify every possible island. Analysis to determine islands does not need to predict how island boundaries might form in future events. The SDT modified the criteria for identifying islands. (R3, R4, R5)
- The UFLS system must be designed such that frequency does not drop bellow 58.0 Hz for an imbalance up to and including 25% (rather than "of at least 25%") — for an imbalance exceeding 25%, Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. The 25% represents the imbalance between load and generation not the amount of load to include in the UFLS program - the imbalance = (load – actual generation output)/ (load) of up to 25 percent within the identified island – the intent is that this would work for any load level (peak, off-peak, etc.). The design of the UFLS program, as demonstrated by simulation, must comply with the performance characteristics, not its performance during an event. (R6)
- The cumulative limits apply for each simulated event; not cumulatively for all actual system events. The standard does not require measuring compliance for actual events against the standard. (R6.2)
- Revised the performance characteristics (Requirement R6.2) from 59.5 Hz to 59.3 Hz for 30 seconds while still maintaining coordination with typical turbine operating characteristics.
- Revised the performance characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate

with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).

- Modified the performance characteristic in R6.4 to specify where to measure voltages during simulated events.
- Added a requirement (R7.3) in the proposed continent-wide standard to require modeling of automatic load restoration in the five year assessments performed by the group of Planning Coordinators in each region.
- Revised the performance characteristic (Requirement R8) to require annual updates of the database. The SDT also removed the annual certification noting this obligation is effectively addressed by Requirements R9 (annual database updates) and R10 (provide load tripping in accordance with the UFLS program design). The measures by which compliance with these Requirements will be assessed will be defined in the Measures section of the proposed standard.

There were several minority issues that were not resolved when the characteristics were translated into requirements, including the following:

- A preference for a set of Regional Standards in support of continent-wide characteristics, but not a continent-wide standard. The SDT believes that the continent-wide standard will eliminate the confusion caused with the originally proposed requirements that were intended to direct the Regions to create Regional Reliability Standards for UFLS that met the common performance characteristics. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.
- Concern that the performance characteristics may be too specific to accommodate the needs of every region or they may be too extreme for some regions. The SDT feels that the performance characteristics set forth in the proposed continent wide standard are intended to ensure coordination among the programs that Planning Coordinators are required to design.
- Recommendation to revise the performance characteristic from 58.4 Hz to 59.4 Hz for up to nine minutes and continuous above 59.4 Hz. The suggested settings do not coordinate with generator under-frequency time durations allowed by manufacturers.
- Recommendation to specify a minimum size of the postulated island that is of sufficient size to affect the Bulk Electric System and have frequency overshoot requirements for the entire Eastern Interconnection as well as for smaller identified islands. The SDT believes that the UFLS programs must be designed such that all interconnected systems will meet common performance characteristics. Common performance characteristics facilitate coordination between regions. An island could be subject to other performance characteristics in addition to the common performance characteristics for imbalances greater than 25% if the Regional Entities develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.
- Recommendation to establish a common format for the database. The SDT believes that a variety of formats could serve reliability equally well and as such the SDT does not feel compelled to specify a format in the proposed continent-wide standard. The group of Planning Coordinators in each region has been assigned the responsibility for assessments of the UFLS program in the proposed continent-wide standard and is therefore best suited to identify the program database format.

- Recommendation to allow "analytical studies" instead of "dynamic simulations" to verify the UFLS program design. The SDT believes it is not possible to verify the adequacy of the implementation of the regional UFLS program in achieving the performance characteristics without some sort of dynamic simulation and has decided to retain this level of specificity.

If you feel that your comment has been overlooked, please let us know immediately. Our goal is to give every comment serious consideration in this process! If you feel there has been an error or omission, you can contact the Vice President and Director of Standards, Gerry Adamski, at 609-452-8060 or at gerry.adamski@nerc.net. In addition, there is a NERC Reliability Standards Appeals Process.[1]

[1] The appeals process is in the Reliability Standards Development Procedures: http://www.nerc.com/standards/newstandardsprocess.html.

Index to Questions, Comments, and Responses

The Industry Segments are:

1 — Transmission Owners
2 — RTOs, ISOs
3 — Load-serving Entities
4 — Transmission-dependent Utilities
5 — Electric Generators
6 — Electricity Brokers, Aggregators, and Marketers
7 — Large Electricity End Users
8 — Small Electricity End Users
9 — Federal, State, Provincial Regulatory or other Government Entities
10 – Regional Reliability Organizations, Regional Entities

	Individual or group.	Name	Organization	Registered Ballot body segment (check all industry segments in which your company is registered)
	Individual	Karl Kohlrus	City Water, Light & Power - Springfield, IL	1 - Transmission Owners, 3 - Load-serving Entities, 5 - Electric Generators
	Group	Guy Zito	NPCC	10 - Regional Reliability Organizations/Regional Entities

	Additional Member	Additional Organization	Region	Segment Selection
1.	Ed Thompson	Consolidated Edison Co. of New York, Inc.	NPCC	1
2.	David Kiguel	Hydro One Networks Inc.	NPCC	1
3.	Sylvain Clermont	Hydro-Quebec TransEnergie	NPCC	1
4.	Frederick White	Northeast Utilities	NPCC	1
5.	Roger Champagne	Hydro-Quebec TransEnergie	NPCC	2
6.	Ron Falsetti	Independent Electricity System Operator	NPCC	2
7.	Kathleen Goodman	ISO - New England	NPCC	2
8.	Randy MacDonald	New Brunswick System Operator	NPCC	2
9.	Gregory Campoli	New York Independent System Operator	NPCC	2

	Individual or group.	Name	Organization	Registered Ballot body segment (check all industry segments in which your company is registered)	
10.	Michael Ranalli		National Grid	NPCC	3
11.	Ronald E. Hart		Dominion Resources, Inc.	NPCC	5
12.	Ralph Rufrano		New York Power Authority	NPCC	5
13.	Brian L. Gooder		Ontario Power Generation Incorporated	NPCC	5
14.	Michael Gildea		Constellation Energy	NPCC	6
15.	Brian D. Evans-Mongeon		Utility Services	NPCC	6
16.	Donald E. Nelson		Massachusetts Dept. of Public Utilities	NPCC	9
17.	Brian Hogue		NPCC	NPCC	10
18.	Alan Adamson		New York State Reliability Council	NPCC	10
19.	Guy Zito		NPCC	NPCC	10
20.	Lee Pedowicz		NPCC	NPCC	10
21.	Gerry Dunbar		NPCC	NPCC	10
	Individual	Edwin Averill	Grand River Dam Authority	5 - Electric Generators, 1 - Transmission Owners, 9 - Federal, State, Provincial Regulatory, or other Government Entities	
	Group	Ken McIntyre	ERCOT	2 - RTOs and ISOs	
	Individual	Don McInnis	Florida Power & Light	1 - Transmission Owners	
	Individual	Vic. Baerg	Manitoba Hydro	1 - Transmission Owners, 5 - Electric Generators, 3 - Load-serving Entities, 9 - Federal, State, Provincial Regulatory, or other Government Entities, 6 - Electricity Brokers, Aggregators	
	Individual	Thad Ness	American Electric Power (AEP)	6 - Electricity Brokers, Aggregators , 3 - Load-serving Entities, 5 - Electric Generators, 1 - Transmission Owners	

	Individual or group.	Name	Organization	Registered Ballot body segment (check all industry segments in which your company is registered)
	Group	Annette Bannon	PPL Generation	1 - Transmission Owners, 5 - Electric Generators, 6 - Electricity Brokers, Aggregators

Additional Member	Additional Organization	Region	Segment Selection	
1.	Mark Heimbach	PPL EnergyPlus	MRO	6
2.			NPCC	6
3.			RFC	6
4.			SERC	6
5.			SPP	6
6.	John Cummings	PPL EnergyPlus	WECC	6
7.	Joe Kisela	PPL Generation	RFC	5
8.			NPCC	5
9.	Tom Lehman	PPL Montana	WECC	5
10.	Dave Gladey	PPL Susquehanna	RFC	5
11.	Mike DeCesaris	PPL Electric Utilities	RFC	1
12.	Gabe Laczo	PPL Electric Utilities	RFC	1
13.	Gary Bast	PPL Electric Utilities	RFC	1
14.	Dave Price	PPL Electric Utilities	RFC	1

	Group	Lynn Schroeder	Southwest Power Pool (SPP UFLS Standard Drafting Team)	10 - Regional Reliability Organizations/Regional Entities
	Group	Brian Bartos	Bandera Electric Cooperative (TRE Regional UFLS Standard Drafting Team)	1 - Transmission Owners

Additional Member	Additional Organization	Region	Segment Selection	
1.	Dennis Kunkel	AEP	ERCOT	1
2.	Randy Jones	Calpine	ERCOT	5
3.	Matt Pawlowski	FPL Energy	ERCOT	5

	Individual or group.	Name	Organization	Registered Ballot body segment (check all industry segments in which your company is registered)
4.		Rayborn Reader	EPCO	ERCOT 7
5.		Eddy Reece	Rayburn Country	ERCOT 1
6.		Barry Kremling	GVEC	ERCOT 1
7.		Sergio Garza	LCRA	ERCOT 1
8.		Steve Myers	ERCOT ISO	ERCOT 2
9.		Ken McIntryre	ERCOT ISO	ERCOT 2
	Individual	O. J. Brouillette	Louisiana Generating, LLC	3 - Load-serving Entities, 5 - Electric Generators, 4 - Transmission-dependent Utilities, 1 - Transmission Owners
	Individual	Steve Harmath	Orrville Utilities	4 - Transmission-dependent Utilities
	Group	Marie Knox	Midwest ISO	2 - RTOs and ISOs

Additional Member	Additional Organization	Region	Segment Selection	
1.	Kirit Shah	Ameren	SERC	1
2.	Jim Cyrulewski	JDRJC Associates	RFC	8

	Group	Jim Busbin	Southern Company Services, Inc	5 - Electric Generators, 1 - Transmission Owners

Additional Member	Additional Organization	Region	Segment Selection	
1.	Chris Wilson	Southern Company Services	SERC	1
2.	Terry Coggins	Southern Company Services	SERC	1
3.	Jonathan Glidewell	Southern Company Services	SERC	1
4.	Raymond Vice	Southern Company Services	SERC	1
5.	J. T. Wood	Southern Company Services	SERC	1
6.	Terry Crawley	Southern Company Services	SERC	5
7.	Marc Butts	Southern Company Services	SERC	1

	Individual or group.	Name	Organization	Registered Ballot body segment (check all industry segments in which your company is registered)
	Individual	Mark Kuras	PJM	2 - RTOs and ISOs
	Group	Peter Heidrich	Florida Reliability Coordinating Council	1 - Transmission Owners, 4 - Transmission-dependent Utilities, 3 - Load-serving Entities, 10 - Regional Reliability Organizations/Regional Entities, 5 - Electric Generators

Additional Member	Additional Organization	Region	Segment Selection	
1.	Jerry Murphy	Reedy Creek Improvement District	FRCC	3
2.	John Shaffer	Florida Power & Light	FRCC	1
3.	John Odom	FRCC	FRCC	10
4.	Fabio Rodriguez	Progress Energy	FRCC	1
5.	Don GIlbert	JEA	FRCC	5
6.	Alan Gale	City of Tallahassee	FRCC	5
7.	Don McInnis	Florida Power & Light	FRCC	1
8.	Art Nordlinger	Tampa Electric Company	FRCC	1
9.	FRCC System Protection & Control Subcommittee	FRCC	FRCC	10

	Group	Bob Jones	Southern Company Services, Inc. - Trans	1 - Transmission Owners

Additional Member	Additional Organization	Region	Segment Selection	
1.	Rick Foster	Ameren	SERC	1
2.	Anthony Williams	Duke Energy Carolinas	SERC	1
3.	Greg Davis	Georgia Transmission Corp.	SERC	1
4.	Ernesto Paon	Municipal Electric Authority of Georgia	SERC	1
5.	Andrew Fusco	NC Municipal Power Agency #1	SERC	1
6.	John O'Connor	Progress Energy Carolinas	SERC	1
7.	Pat Huntley	SERC Reliability Corp.	SERC	10
8.	Jonathan Glidewell	Southern Company Services, Inc. - Trans	SERC	1

	Individual or group.	Name	Organization	Registered Ballot body segment (check all industry segments in which your company is registered)
9.		Tom Cain	Tennessee Valley Authority	SERC 1
	Individual	Kevin Koloini	Buckeye Power, Inc.	3 - Load-serving Entities, 4 - Transmission-dependent Utilities, 5 - Electric Generators
	Individual	Rick White	Northeast Utilities	1 - Transmission Owners
	Individual	Howard Rulf	We Energies	5 - Electric Generators, 4 - Transmission-dependent Utilities, 3 - Load-serving Entities
	Individual	John W Shaffer	Florida Power & Light Co.	1 - Transmission Owners
	Individual	Eric Mortenson	Exelon	1 - Transmission Owners, 3 - Load-serving Entities
	Individual	D. Bryan Guy	Progress Energy Carolinas, Inc.	3 - Load-serving Entities, 5 - Electric Generators, 1 - Transmission Owners
	Individual	Kirit Shah	Ameren	6 - Electricity Brokers, Aggregators , 3 - Load-serving Entities, 1 - Transmission Owners
	Group	Ken Goldsmith (MRO NERC Standards Review Subcommittee)	Alliant Energy	4 - Transmission-dependent Utilities

Additional Member	Additional Organization	Region	Segment Selection	
1.	Neal Balu	WPS	MRO	3, 4, 5, 6
2.	Terry Bilke	MISO	MRO	2
3.	Carol Gerou	MP	MRO	1, 3, 5, 6
4.	Jim Haigh	WAPA	MRO	1, 6
5.	Tom Mielnik	MEC	MRO	1, 3, 5, 6
6.	Pam Sordet	Xcel	MRO	1, 3, 5, 6
7.	Dave Rudolph	BEPC	MRO	1, 3, 5, 6
8.	Eric Ruskamp	LES	MRO	1, 3, 5, 6

	Individual or group.	Name	Organization	Registered Ballot body segment (check all industry segments in which your company is registered)
9.		Joseph Knight	GRE	MRO	1, 3, 5, 6
10.		Joe DePoorter	MGE	MRO	3, 4, 5, 6
11.		Larry Brusseau	MRO	MRO	10
12.		Michael Brytowski	MRO	MRO	10
	Group	Brent Ingebrigtson	E.ON U.S.	6 - Electricity Brokers, Aggregators , 3 - Load-serving Entities, 5 - Electric Generators, 1 - Transmission Owners
	Individual	Kris Manchur	Manitoba Hydro	5 - Electric Generators, 6 - Electricity Brokers, Aggregators , 3 - Load-serving Entities, 1 - Transmission Owners
	Group	Sandra Shaffer	PacifiCorp	1 - Transmission Owners, 5 - Electric Generators, 3 - Load-serving Entities

Additional Member	Additional Organization	Region	Segment Selection	
1.	Mike Viles	Transmission Technical Operations	WECC	1
2.	Kelly Johnson	Transmission Customer Service Engineering	WECC	1
3.	Terry Doern	Transmission Technical Operations	WECC	1
4.	Gregory Vasallo	Transmission Customer Service Engineering	WECC	1
5.	Stephen Hitchens	Transmission Technical Operations	WECC	1
6.	Rebecca Berdahl	Power Long Term Sales and Purchases	WECC	3

	Group	Denise Koehn	Transmission Reliability Program	3 - Load-serving Entities, 5 - Electric Generators, 1 - Transmission Owners, 6 - Electricity Brokers, Aggregators
	Individual	Ron Falsetti	Independent Electricity System Operator	2 - RTOs and ISOs
	Individual	Wayne Kemper	CenterPoint Energy	1 - Transmission Owners
	Group	Sam Ciccone	FirstEnergy Corp.	1 - Transmission Owners, 5 - Electric Generators, 3 - Load-serving Entities, 6 - Electricity Brokers, Aggregators

	Individual or group.	Name	Organization	Registered Ballot body segment (check all industry segments in which your company is registered)

Additional Member	Additional Organization	Region	Segment Selection
1.	Doug Hohlbaugh	FirstEnergy	RFC	1, 3, 5, 6
2.	Dave Folk	FirstEnergy	RFC	1, 3, 5, 6
3.	Art Buanno	FirstEnergy	RFC	1
4.	Jim Detweiler	FirstEnergy	RFC	1
5.	Bob McFeaters	FirstEnergy	RFC	1
6.	Ken Dresner	FirstEnergy	RFC	5
7.	Bill Duge	FirstEnergy	RFC	5

	Group	Jason Shaver	American Transmission Company	1 - Transmission Owners
	Individual	Scott Berry	Indiana Municipal Power Agency	4 - Transmission-dependent Utilities
	Individual	Greg Rowland	Duke Energy	5 - Electric Generators, 6 - Electricity Brokers, Aggregators , 3 - Load-serving Entities, 1 - Transmission Owners
	Group	Greg Davis	Georgia Transmission Corporation	1 - Transmission Owners
	Individual	Greg Ward / Darryl Curtis	Oncor Electric Delivery	1 - Transmission Owners
	Individual	Ed Davis	Entergy	
	Group	Robert Rhodes	Southwest Power Pool	1 - Transmission Owners, 2 - RTOs and ISOs, 3 - Load-serving Entities, 4 - Transmission-dependent Utilities, 5 - Electric Generators

Additional Member	Additional Organization	Region	Segment Selection	
1.	Bill Bateman	East Texas Electric Coop.	SPP	3, 4
2.	John Boshears	City Utilities of Springfield	SPP	1, 3, 5
3.	Brian Berkstresser	Empire District Electric	SPP	1, 3, 5

	Individual or group.	Name	Organization	Registered Ballot body segment (check all industry segments in which your company is registered)	
4.		Mike Gammon	Kansas City Power & Light	SPP	1, 3, 5
5.		Don Hargrove	Oklahoma Gas & Electric	SPP	1, 3, 5
6.		Danny McDaniel	CLECO	SPP	1, 3, 5
7.		Kyle McMenamin	Southwestern Public Service Company	SPP	1, 3, 5
8.		Eddy Reece	Rayburn Country Electric Coop	SPP	3, 4
9.		Robert Rhodes	Southwest Power Pool	SPP	2

1. The SDT determined that there is no need to have a continent-wide standard, and proposes that all UFLS requirements be contained within the regional UFLS standards developed in accordance with the Characteristics of UFLS Regional Reliability Standards. The SDT developed a set of characteristics which each of the regional entities will be directed to include in its UFLS regional reliability standard. The SDT developed these characteristics in an attempt to direct the regional entities to develop requirements based on system performance, without prescribing specifics of how to meet the specified performance. Do you agree with the drafting team?

Summary Consideration:

The Underfrequency Load Shedding Drafting team reviewed comments for this question and has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a proposed continent wide standard that will follow the standards development process. The team acknowledges that this is a shift in approach but sees many benefits to proceeding with a continent-wide standard.

1. While the majority of the comments indicated support for the creation of Regional Standards that determine the details of the UFLS programs the majority of the comments also generally supported the concept of applying common continent-wide characteristics. The Regional Standards would have to meet these common performance characteristics. The creation of a continent-wide standard does not deviate from this approach but rather eliminates the confusion caused with this new form of requirement that was intended to direct the Regions to create Regional Reliability Standards for UFLS that met the common performance characteristics.
2. The creation of a continent-wide standard does not prohibit the creation of Regional Standards for UFLS. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. This approach still allows each region to develop requirements that meet the specific needs of the region while still maintaining a continent-wide level of reliability.
3. Several commenters expressed concern that the approach set forth in the first posting (the directive to the Regions containing the performance characteristics) was "a new kind of requirement listing [that] circumvents the Standard Development Procedure". Further, commenters expressed concern that this approach creates a "new class of Standards [that] creates confusion" namely that is unclear how the characteristics would be revised in the future and the role stakeholders would play in future revisions. The SDT agrees with these comments and feels that by creating a continent wide standard containing the performance characteristics these concerns will be addressed leaving the more detailed requirements (if needed) to a Regional Standard or Regional Variance as outlined in the NERC Rules of Procedure.
4. Several commenters indicated that they thought it appropriate that the Regions develop the details of the UFLS program such as the total amount to load shed; how many blocks at what frequency, etc. The SDT clarifies that the performance characteristics are intended to ensure coordination among the programs. In the proposed continent-wide standard the SDT assigned the responsibility of designing the UFLS program to the Planning Coordinator (Requirement R2). The Planning Coordinators within a region will define the amount of load shed required, how many blocks, at what frequency, etc. (these specific requirements are not contained in the proposed continent wide standard).
5. Several commenters indicated that the performance characteristics may be too specific to accommodate the needs of every region or they may be too extreme for some regions. The SDT feels that the performance characteristics set forth in the proposed continent wide standard are intended to ensure coordination among the programs that Planning Coordinators are required to design. For an imbalance up to and

including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.

6. Several commenters asked the SDT to clarify if their intent is to withdraw PRC-006-0, PRC-007-0 and PRC-009-0 when applicable regional replacement standards are established and become effective. In addition, the commenters interpreted that the SDT directive approach was a means for NERC to require the Regions to develop appropriate Regional standards that share continent-wide characteristics because NERC standards cannot be applied to Regional Entities. The SDT recognizes that NERC standards should not be applicable to Regional Entities and confirms that this was the original intent of the "UFLS Regional Reliability Standard Characteristics"; however, the SDT decided to convert the directive into a continent wide standard as a means for NERC to require shared continent wide characteristics applicable to Planning Coordinators, Transmission Owners, and Distribution Providers. The proposed continent wide standard would replace PRC-006-0, PRC-007-0, and PRC-009-0 once it is approved and becomes effective.

Organization	Question 1:	Question 1 Comments:
PJM	No	UFLS should be used as a safety net, based on installation requirements rather than performance requirements. As it is currently worded, if your UFLS load shedding does not arrest a blackout, you could potentially be found non-compliant.
Response: The design of the UFLS program, as demonstrated by simulation, must comply with the performance characteristics, not its performance during an event. The standard has been modified to further clarify this point (Requirement R6).		
Exelon	No	This document, 'Characteristics of UFLS Regional Reliability Standards' is not a NERC Standard, yet it contains requirements for adherence by parties other than NERC or a Region. This new kind of requirement listing circumvents the Standard Development Procedure. It is not clear how this could ever be revised or what role stakeholders have in this. The creation of a new class of Standards creates confusion and is contrary to the well developed process that has been established. Why couldn't this be a NERC Standard, with all of the recognized checks and balances provided with that process, while at the same time leaving the few requirements that really need to be 'fill in the blank' up to a more detailed Regional Standard?
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and will follow the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
Oncor Electric Delivery	No	Oncor Electric Delivery does not believe that this document should be issued at this time. Many of the proposed design characteristics are based on parameters contained in the proposed NERC Reliability Standard PRC-024 which is still in the development stage. This document should be reissued for comments once PRC-024 has been approved.
Response: The SDT agrees that performance characteristics should be based on the proposed generator under-frequency time durations in PRC-024. In addition, the SDT coordinated with the PRC-024 Generator Verification Standard Drafting Team (GV SDT)by providing the underfrequency performance curve to ensure that		

Organization	Question 1:	Question 1 Comments:
the performance characteristics do not conflict with the generator off nominal frequency capability curve. The SDT will continue to coordinate with the GV SDT and we believe it does not matter whether PRC-006 or PRC-024 is approved first as long as this coordination exists.		
Southwest Power Pool	No	We have concerns that in eliminating the continent-wide standard we are also eliminating continent-wide enforcement and the common denominator that NERC provides through the reliability standards. Under the proposal, enforcement would apparently fall to each regional entity which could lead to inconsistency across an interconnection.
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and will follow the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
CenterPoint Energy	No	CenterPoint Energy believes this document has been issued for comments prematurely and recommends this effort be postponed until the proposed NERC Reliability Standard PRC-024 (Generator Protective System Performance During Frequency and Voltage Excursions) has been fully developed and vetted by all stakeholders through the NERC process. The prescriptive technical design characteristics proposed in these Characteristics of UFLS Regional Reliability Standards are based on parameters contained in the proposed PRC-024 that have not yet been issued to the industry for comments. It is premature to base these Characteristics on another standard that is still in the development process. **Response:** The SDT agrees that performance characteristics should be based on the proposed generator under-frequency time durations in PRC-024. In addition, the SDT coordinated with the PRC-024 Generator Verification Standard Drafting Team (GV SDT) by providing the underfrequency performance curve to ensure that the performance characteristics do not conflict with the generator off nominal frequency capability curve. The SDT will continue to coordinate with the GV SDT and we believe it does not matter whether PRC-006 or PRC-024 is approved first as long as this coordination exists. As an alternative to postponing this effort, the proposed prescriptive technical characteristics could be deleted. While CenterPoint Energy proposes less restrictive characteristics in response to Questions 2, 3, and 4 below, our recommendation is that they be deleted or that Project 2007-1 be postponed. All the proposed technical design parameters appear to apply only for "underfrequency conditions resulting from an imbalance between load and generation of at least 25 percent". This characterization is simplistic and does not address all UFLS needs for other system conditions that can occur. The imbalance and response to an imbalance can vary dramatically considering not only the amount of generation that's on-line, but also the type of generation on-line. System response will depend upon governor response and system inertia. For example, in order to arrest frequency decay for a 25% load / generation imbalance within prescribed parameters under certain conditions, a region may have to employ aggressive load shedding that might cause an overshoot beyond prescribed parameters under other conditions. This is especially true for regions that have significant penetration of wind energy, where system performance can vary widely depending upon system load and the composition of assumed on-line generation under various conditions. The open ended requirement for arresting frequency after an initial imbalance of at least 25% could be interpreted to encompass imbalances of 50%, 75% or even

Organization	Question 1:	Question 1 Comments:
		100% which is infeasible. **Response:** The SDT agrees that the system off nominal frequency performance is a function of many factors and that simulation modeling assumptions can vary widely. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. Compliance with performance characteristics when the imbalance is greater than 25 % is not required by this standard. The SDT believes that proposed performance characteristics values are achievable for generator deficits up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.
PPL Generation	Yes and No	PPL Corporation agrees with the SDT that a continent-wide standard is not practical and having the regional entities develop a process and appropriate requirements consistent with the "Characteristics of UFLS Regional Reliability Standards" is the most effective way to ensure a reliable transmission system. We also agree it is necessary for the standard to establish specific limits. However, rigid adherence to the stated characteristics may not be possible for certain generating facilities because of equipment limitations or manufacturer recommended over/under frequency protection requirements. Such limitations or requirements can not be ignored. As such, provisions to deviate from stated characteristics in these instances must be included in any regional entity standard developed. The expectation is that the generator would provide documentation as to why a specific characteristic can not be met and the regional entity would review the issue and determine if mis-coordination with the UFLS program exists. If mis-coordination does exist, the regional entity, with input from the host TO/TSP and the generator, would then be responsible for appropriate mitigation measures (i.e. shedding of additional load).
Response: The SDT believes that the generating equipment limitations should be addressed in the Project 2007-09: Generator Verification PRC-024 because part of the purpose of the standard (as stated in the SAR) is: “To ensure that generators will not trip off-line during specified voltage and frequency excursions.” The SDT is coordinating with Project 2007-09: Generator Verification (PRC-024) and will continue to do so as the projects develop.		
Ameren	Yes and No	We agree that there is no need for a continent-wide UFLS standard. However, numerous system conditions would need to be studied to identify potential islands (Characteristic #2), and we doubt that the analyses to be performed would often accurately predict how the system would separate with any certainty. Also, it is likely that any separation would not be along company or regional lines. Therefore, we suggest that each region involve and coordinate neighboring regions in these studies and in the development of the regional UFLS standard and its requirements.
Response: The SDT agrees that analysis to determine islands would not necessarily predict how island boundaries would form in real events. However, it is necessary to identify island(s) as a basis for designing the UFLS program (Requirement R5). Assessment of islands that overlap regional boundaries requires coordination between adjacent regions. The intent of characteristic 3 (Requirement R4) is to ensure		

Organization	Question 1:	Question 1 Comments:
that Planning Coordinators have procedures in place to carry out required coordination.		
Midwest ISO	Yes and No	We agree with the drafting team's approach in developing a set of system characteristics rather than a continent wide standard. We are concerned though that when standards PRC-006, PRC-007, and PRC-009 are replaced that information and requirements could be lost that are important to UFLS. Regional standards drafting teams should review the content of these existing standards to determine what should be transferred to their standards. We believe that the characteristics are a good starting point and should set a minimum level of performance expected. The drafting team should consider whether there are any special systems (such as a peninsula) that may warrant different criteria and allow the regional standards to consider other criteria for those systems. To better assess the quality of the characteristics, the drafting team should provide the history behind these characteristics. Where did they come from? How were they derived? Did they come from old regional reliability organization (from MAIN, MAPP, ECAR, etc) criteria?
Response: The SDT team developed a mapping document (included in the Implementation Plan) to ensure that requirements would not be lost. This may address the concerns regarding losing requirements in the merging of the three standards. The SDT notes that the requirements that were not included in the proposed characteristics are currently included in the NERC ERO Rules of Procedure (Appendix 8 – NERC Blackout and Disturbance Response Procedures). If the commenter feels (after reviewing the mapping) that the SDT has left out requirements please inform the SDT. The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. Regarding the history for the performance characteristics, the technical basis for the performance characteristics was developed through a review of relevant industry standards that include voltage and frequency limits for major electrical equipment. The performance characteristics were selected to prevent equipment damage and to coordinate with generating unit protection. The SDT included more details regarding the technical justification for the performance characteristics in the comment form background (including specific IEEE standards). In addition, the SDT coordinated with the PRC-024 Generator Verification Standard Drafting Team by providing the underfrequency performance curve to ensure that the performance characteristics do not conflict with the generator off nominal frequency capability curve.		
Alliant Energy	Yes and No	The MRO believes that the Regions should determine the details of the UFLS. We believe the regions are best situated to perform the studies and determine the total amount of load shed required, how many blocks, at what frequency, etc. This includes setting regional performance objectives for UFLS design, and deciding on generator under/over frequency minimum time delays and frequency setpoints. **Response:** The SDT has decided to convert the “Characteristics of UFLS Regional Reliability Standards” into a continent-wide standard and will follow the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. The Planning Coordinators within a region will define the amount of load shed required, how many

Organization	Question 1:	Question 1 Comments:
		blocks, at what frequency, etc. Generator under/over frequency minimum time delays and frequency setpoints are covered under PRC-024 Generator Verification. The MRO believes that the Under Frequency Load Shedding Standard Drafting Team is headed in the right direction as far as allowing the regions to create their own UFLS program within continental wide characteristics. It's the MRO's contention that while the 11 general characteristics are reasonable they may be too specific to accommodate the needs of every region or they may be too extreme for every region. The MRO asks that the UFLS SDT allow the regions a reasonable amount of time to determine the specific number which would accommodate the general NERC objectives but would address regional conditions. **Response:** The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. There are some inconsistencies in the document as the Characteristics listed in the "UFLS Regional Reliability Standard Characteristics" document do not match with those listed in this comment form in the "Characteristics of UFLS Regional Reliability Standards" section. Specifically, 1) What is the technical justification for the frequency overshoot limit of 61 Hz? (third bullet) 2) What is the technical justification for the time durations for the Volts/Hz? (Fourth Bullet) **Response:** Performance characteristic 4.4 (Requirement R6.4) states that: Control voltage during and following UFLS operations such that the per unit Volts per Hz (V/Hz) does not exceed 1.18 for longer than two seconds cumulatively per simulated event, and does not exceed 1.10 for longer than 45 seconds cumulatively per simulated event. The comment form does not reflect the characteristic but should have. This was an oversight. Regarding the justification for the Volts/Hz performance characteristic, the technical basis for this performance characteristic was developed through a review of relevant industry standards that include voltage and frequency limits for major electrical equipment. The performance characteristics were selected to prevent equipment damage and to coordinate with generating unit protection. The SDT included more details regarding the technical justification for the performance characteristics in the comment form background (including specific IEEE standards). The MRO interprets that the STD is proposing the withdrawal of the PRC-006-0, PRC-007-0, and PRC-009-0 standards when applicable Regional replacement standard(s) are established and become effective. The MRO also interprets that the STD is proposing UFLS Regional Reliability Standard Characteristics, rather than revising the NERC UFLS

Organization	Question 1:	Question 1 Comments:
		standards, because NERC standards cannot be applicable to Regional Entities and the Characterizes may be a means for NERC to require the Regions to develop appropriate Regional standards that share key continent-wide characteristics. **Response:** The SDT recognizes that NERC standards should not be applicable to Regional Entities and confirms that this was the original intent of the "UFLS Regional Reliability Standard Characteristics"; however, the SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard as a means for NERC to require shared continent-wide characteristics. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. The MRO agrees that the existing NERC standards could be replaced with appropriate Regional standards and believe that some UFLS program requirements should be different in different Regions. The MRO disagrees that the Characteristics should direct Regional Entities to be based on continent-wide system performance values. Appropriate system performance levels and appropriate percentage of load shedding will vary for each potential island and depend on the composition of load, generation, and system protection within the island. The continent-wide Characteristics should deal with such broader issues such as: identification of potential islands, coordination among accountable entities, identification of appropriate load shedding percentage, identification and coordination with island-specific generation-related limits and system protection settings, responsibility for UFLS program design and implementation, responsibility for and frequency of UFLS program assessment, etc. **Response:** The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. The Planning Coordinators within a region will define the amount of load shed required, how many blocks, at what frequency, etc. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.
FirstEnergy Corp.	Yes and No	We agree with the SDT that there is no need for NERC to develop a continent-wide standard since there is already much work being done in some regions already creating their own regional standard. And we agree that NERC should at least specify the minimum expectations of UFLS programs needed by each region so that there is continent-wide consistency in the creation and implementation of regional UFLS standards. However, it is not clear how this document will be maintained in the NERC reliability standards realm. This document does not appear to have a standard number and version so that it can be maintained and used as a living document to be used as a reference for the minimum regional requirements. We are concerned that after these minimum regional characteristics are vetted through industry and subsequently used by the regions to create their initial versions of their region's UFLS standard, they will not be transparent to the regions years from now when they revise their standards. Additionally, at some point NERC and industry may determine the need to add and/or revise these minimum regional characteristics due to ever changing

Organization	Question 1:	Question 1 Comments:
		industry technology or methodologies regarding UFLS equipment design and utilization.
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and will follow the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
American Transmission Company	Yes and No	ATC interprets that the STD is proposing the withdrawal of the PRC-006-0, PRC-007-0, and PRC-009-0 standards when applicable Regional replacement standard(s) are established and become effective. ATC also interprets that the STD is proposing UFLS Regional Reliability Standard Characteristics, rather than revising the NERC UFLS standards, because NERC standards can not be applied to Regional Entities and the Characteristics may be a means for NERC to require the Regions to develop appropriate Regional standards that share key continent-wide characteristics. **Response:** The SDT recognizes that NERC standards should not be applicable to Regional Entities and confirms that this was the original intent of the "UFLS Regional Reliability Standard Characteristics"; however, the SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard as a means for NERC to require shared continent-wide characteristics. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. We agree that the existing NERC standards could be replaced with appropriate Regional standards and believe that some UFLS program requirements should to be different in different Regions. ATC disagrees that the Characteristics should direct Regional Entities to be based on continent-wide system performance values. Appropriate system performance values and appropriate percentage of load shedding will vary for each potential island and depend on the nature of load, generators, protection schemes, and dispatch within each island. The continent-wide Characteristics should deal with such broader issues such as: identification of potential islands, coordination among accountable entities, identification of appropriate load shedding percentage, identification and coordination with island-specific generation-related limits and system protection settings, responsibility for UFLS program design and implementation, , responsibility for and frequency of UFLS program assessment, the factors to be considered in assessments, etc. **Response:** The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. The Planning Coordinators within a region will define the amount of load shed required, how many blocks, at what frequency, etc. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.

Organization	Question 1:	Question 1 Comments:
City Water, Light & Power - Springfield, IL	Yes	In the Eastern Interconnection, it's probably good that not all regions shed load and the same frequencies. Doing so could lead to unstable conditions when the grid is already stressed.
Response: The SDT disagrees that having all regions shed load at the same frequency could lead to an unstable condition, however, the SDT confirms that it is not necessary for all regions to shed load at the same frequencies.		
Manitoba Hydro	Yes and No	Manitoba Hydro agrees that region must have the flexibility to institute a UFLS that meets its region's topology requirements. Manitoba Hydro also agrees that the SDT should develop requirements based on system performance. However, the performance targets outlined in the characteristics document are not all appropriate for every region (specifics described in following comments).
Response: Please see our responses to your comments on the following questions.		
Entergy	Yes and No	In general, we agree with the specifics prescribed by the drafting team and believe it is in the best interest of reliability to develop specific operating characteristics for each region. However, we do not agree with the design parameters set in section 4.
Response: Please see our responses to your comments on Questions 3 and 4.		
Southwest Power Pool	Yes	The Regional Entity intent is to address the performance characteristics as recommended by the NERC SDT, but not necessarily include those specific characteristics as requirements in the Regional Standard.
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and will follow the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
Bandera Electric Cooperative	Yes	The Texas Regional Entity Regional Underfrequency Standard Drafting Team (TRE UFLS SDT) agrees with the direction that the NERC team is proposing. Performance outcomes should be the focus of the regional standards development to allow for the proper integration of practices that have long been based on regional differences and practices. Those practices, where they obviously lend themselves to achieving the expected reliability outcomes, should be respected and incorporated in the development of these new regional standards.
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and will follow the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		

Organization	Question 1:	Question 1 Comments:
Southern Company Services, Inc	Yes	This approach allows each region to develop requirements that meet the specific needs of the region while still maintaining a continent-wide level of reliability.
SERC	Yes	This approach allows each region to develop requirements that meet the specific needs of the region while still maintaining a continent-wide level of reliability.
Progress Energy Carolinas, Inc.	Yes	This approach allows each region to develop requirements that meet the specific needs of the region while still maintaining a continent-wide level of reliability.
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and will follow the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
Independent Electricity System Operator	Yes	We support this approach
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and will follow the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
Georgia Transmission Corporation	Yes	This will allow each region to develop standards that meet the specific needs of their region
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and will follow the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
NPCC	Yes	
Grand River Dam Authority	Yes	
ERCOT	Yes	
Florida Power & Light	Yes	

Organization	Question 1:	Question 1 Comments:
American Electric Power (AEP)	Yes	
Louisiana Generqting, LLC	Yes	
Orrville Utilities	Yes	
Florida Reliability Coordinating Council	Yes	
Buckeye Power, Inc.	Yes	
Northeast Utilities	Yes	
We Energies	Yes	
E.ON U.S.	Yes	
PacifiCorp	Yes	
Transmission Reliability Program	Yes	
Duke Energy	Yes	
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and will follow the standards development process. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		

2. As proposed, each regional UFLS standard must require that, for underfrequency conditions resulting from an imbalance between load and generation of at least 25 percent within an interconnection, region, or identified island(s) within or between regions, the UFLS must arrest frequency decline at no less than 58.0 Hz. Do you agree with this design parameter? If you disagree, please identify whether you believe this design parameter should be deleted or revised.

Summary Consideration:

The SDT reviewed the comments received and made several conforming changes to the performance characteristics (now requirements) and/or provided the commenter with a response explaining the team's intent.

- Several commenters requested that the SDT clarify if the intent of this performance characteristic is to ensure an entity's UFLS scheme operates in its entirety prior to 58.0 Hz or that the system frequency must never drop below 58 Hz. The SDT clarified that the intent of the characteristic is that the system must be designed such that frequency does not drop bellow 58.0 Hz for an imbalance up to and including 25%.

- Many commenters indicated in their comments that the terms used in the performance characteristic "imbalance between load and generation" and "at least 25 percent" should be modified or clarified. In response to these comments, the SDT modified the performance characteristic (now Requirement R6) to clarify that an imbalance = (load – actual generation output)/ (load) of up to 25 percent within the identified island. Compliance with the performance characteristics when the imbalance is greater than 25% is not required by this standard. The SDT believes that the proposed characteristics values are achievable for generator deficits up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.

- Some commenters indicated that the 25% stated in the characteristic should represent that amount of load at system peak that could be shed by UFLS relays. The SDT clarified that the 25% represents the imbalance between load and generation not the amount of load to include in the UFLS program. The intent is that this would work for any load level (peak, off-peak, etc.).

- Several of the comments received indicated that UFLS should be used as a safety net based on installation requirement rather than performance requirements. Further, as worded the performance characteristic is almost impossible to meet unless all load is on UFLS. The SDT clarified that the design of the UFLS program, as demonstrated by simulation, must comply with the performance characteristics, not its performance during an event. The standard has been modified to further clarify this point (Requirement R6).

- Several comments indicated that the phrase "identified island" requires clarification. Is it required that the entity identify any island that has the possibility of being formed as a result of a system disturbance? And if so, it is not appropriate for these characteristics to require every possible island to meet the load mismatch criteria. The SDT clarified that it is not the intent to identify every possible island or perform an exhaustive analysis. However, it is necessary to identify island(s) as a basis for designing the UFLS program (Requirement R5). The SDT clarified requirements concerning identification of islands in Requirements R3, R4, and R5. The SDT believes that analysis to determine islands does not need to predict how island boundaries might form in future events.

Organization	Question 2	Question 2 Comments:
American Electric Power (AEP)	No Revise the design parameter as noted in the comments	The statement "the UFLS must arrest frequency decline at no less than 58.0 Hz" needs to be clarified. Is the intent of this characteristic to ensure an entity's UFLS scheme operates in its entirety prior to 58.0 Hz or is it to say that the system frequency must never drop below 58.0 Hz? **Response:** The intent of the statement is that the system be designed such that frequency does not drop below 58.0 Hz for generator deficits up to and including 25%. In addition, the "at least 25 percent" designation should be changed to "25 percent and below". Any imbalance greater than 25-30% is beyond the scope of most UFLS schemes. **Response:** The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. Compliance with performance characteristics when the imbalance is greater than 25 % is not required by this standard. The SDT believes that proposed performance characteristics values are achievable for generator deficits up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.
PPL Generation	No Revise the design parameter as noted in the comments	Some existing generating facilities may have equipment limitations or specific protection issues which require the generator to trip at a frequency level above 58 Hz. This can result in a mis-coordination between the UFLS program and the generator protective settings. The 58 Hz value can be used as the guideline, but provision must be included to allow deviation from the guideline if mis-coordination of UFLS/Generator Frequency protective settings exist and valid technical reasons are provided by a legacy generating facility. See comment to question 1 for further details.
Response: The SDT believes that the generating equipment limitations should be addressed in the Project 2007-09: Generator Verification PRC-024 because part of the purpose of the standard (as stated in the SAR) is: “To ensure that generators will not trip off-line during specified voltage and frequency excursions.” The SDT is coordinating with Project 2007-09: Generator Verification (PRC-024) and will continue to do so as the projects develop.		
Midwest ISO	No Revise the design parameter as noted in the comments	We understand that the 25% stated in the question represents the amount of load at system peak that could be shed by UFLS relays. If our understanding is correct, we support the design parameter and request that the drafting team make it clearer in the characteristics that this is based on system peak load. If not, we request the drafting to change the design parameter to match our understanding.
Response: The 25% represents the imbalance between load and generation not the amount of load to include in the UFLS program. The intent is that this would work		

Organization	Question 2	Question 2 Comments:
for any load level (peak, off-peak, etc.). The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island.		
PJM	No Revise the design parameter as noted in the comments	In Item 4, the statement “at least 25 percent” should be changed to “at most 25 percent”. **Response:** The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. As it is currently worded, the requirement is almost impossible to meet unless all load is on UFLS. We do not believe this was the intent of the drafting team. UFLS should be used as a safety net, based on installation requirements rather than performance requirements. As it is currently worded, if your UFLS load shedding does not arrest a blackout, you could potentially be found non-compliant. **Response:** The design of the UFLS program, as demonstrated by simulation, must comply with the performance characteristics, not its performance during an event. The standard has been modified to further clarify this point (Requirement R6).
Florida Reliability Coordinating Council	No Revise the design parameter as noted in the comments	The context of the phrase “identified island” requires clarification. We read the characteristics document to say the Regional Entity is required to develop a standard with UFLS that specifies the entity(s) responsible for identifying potential islands. We believe this means that the Regional Entity will name a group, such as the FRCC Stability Working Group to determine any islands that should meet the requirements of paragraph 2 in the characteristics document. However, we feel that the characteristic could potentially be misinterpreted as requiring the identification of ?any island? that has the possibility of being formed as the result of a system disturbance. It is not appropriate for these characteristics to require every possible island to meet the load mismatch criteria. **Response:** It is not the intent to identify every possible island or perform an exhaustive analysis. However, it is necessary to identify island(s) as a basis for designing the UFLS program (Requirement R5). The SDT has clarified requirements concerning identification of islands in Requirements R3, R4 and R5. The SDT believes that analysis to determine islands does not need to predict how island boundaries might form in future events. The characteristics should make it clear that the program design should protect significant islands that could be created with credible multiple contingencies. **Response:** The SDT agrees with the spirit of this comment. Requirement R3 will require the group of Planning Coordinators to develop criteria, considering historical events and system studies, to select portions of the Bulk

Organization	Question 2	Question 2 Comments:
		Electric System that may form islands.
Florida Power & Light Co.	No Revise the design parameter as noted in the comments	There may be low probability scenarios where islanding occurs with a load and generation imbalance significantly higher than 25%. The proposed wording could be interpreted to include any conceivable combination of contingencies and operating conditions that leads to islanding. The words at least 25% should be replaced with up to 25%. Alternatively the words identified island(s) could be removed to prevent such an expansive interpretation.
Response: The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. The SDT has clarified requirements concerning identification of islands in Requirements R3, R4 and R5.		
Exelon	No Revise the design parameter as noted in the comments	The wording in Requirement 4 is such that the phrase 'at least 25 per cent imbalance' should be changed to 'a maximum of 25 per cent imbalance'. There should be a size specification on 'identified island' such that it is meaningful to the bulk electric system.
Response: The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. The SDT has clarified requirements concerning identification of islands in Requirements R3, R4 and R5.The SDT disagrees that there should be a size specification for islands, but has modified the requirement to apply to islands containing portions of the Bulk Electric System. The islands identified should be able to meet the performance characteristics for the given conditions.		
Ameren	No Revise the design parameter as noted in the comments	We agree that NERC should establish a minimum percentage of peak load that should be used for in design of UFLS. **Response:** The 25% represents the imbalance between load and generation not necessarily the amount of load to be included in the UFLS program. However, the NERC SDT should provide reasons for their recommendation. **Response:** The 25% represents the imbalance between load and generation not necessarily the amount of load to be included in the UFLS program. The SDT selected the design level of imbalance between load and generation based on a review of the bases for the existing UFLS programs, and notes that it may be necessary for UFLS programs to shed more than 25% of load in order to achieve the performance requirements in Requirement R6. Again, we suggest that regions and subregions within the same interconnection should coordinate their UFLS design parameters. **Response:** Characteristic 3 (Requirement R4) was intended to require that the regional standards ensure

Organization	Question 2	Question 2 Comments:
		coordination occurs on an inter-regional basis.
Alliant Energy	No Revise the design parameter as noted in the comments	The system performance (Requirement 4) prescribed by the SDT is based on typical values and their engineering judgment, and do not reflect how individual systems (or islands) were planned and designed (and what were/are deemed as acceptable risks). We believe it more appropriate for the Planning Coordinators associated with the individual regions/islands to decide what are the appropriate design values (for 4.1 to 4.4), while still coordinating with other regions/islands. We also believe most if not all of the UFLS characteristics can be performed under the auspices of the Planning Coordinator function. **Response:** The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. We agree the UFLS design parameters can be devised by the Planning Coordinators and have assigned the Planning Coordinators this responsibility in the proposed standard. Throughout NERC characteristic list, the words “conditions resulting from an imbalance between load and generation of at least 25%” are used in relation to stated performance objectives. The words “of at least” create confusion as well as the undefined term “imbalance”. The MRO has assumed this means that criteria must be met at the maximum overload level each Regions UFLS program is designed to cover, with all Regions having to shed a minimum of at least 25% of system load. However, this could also mean that criteria only has to be met for a 25% imbalance. This needs to be more clearly stated. The MRO agrees with the concept of NERC establishing a minimum load shedding level for all regions, but we do not know what a 25% imbalance is supposed to be. The definition of imbalance is not given but there is a definition that is common to the subject of UFLS, where overload = OL = (remaining generation — load)/ (remaining generation). To us, imbalance = OL, then: OL = -.25 = (gen ? load)/gen = (.8-1)/.8 This implies 20% load shedding. A 20% load shedding requirement seems a little low. A 25% minimum load shedding requirement seems more reasonable, but each Region would need to consider if that is adequate to satisfy their internal needs. In any event, minimum load shedding requirements should be explicitly stated as X% of load. **Response:** The 25% represents the imbalance between load and generation not the amount of load to include in the UFLS program. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. We agree that a 20% load shedding requirement is low; however, the proposed definition implies a minimum load shedding of 25% as the commenter anticipated. The 58.0 Hz appears to have more of a philosophical basis rather than being solely related to generation protection

Organization	Question 2	Question 2 Comments:
		needs. If generation protection is the issue, then a 58 Hz minimum frequency criteria would not be appropriate for all islands. An island consisting of hydro units could easily accept minimum frequencies below 58 Hz for extended periods. **Response:** The basis for the performance characteristics is coordination with generation protection. We agree that hydro units have wider frequency bands, but any island would not necessarily consist only of hydro units. Systems also need to perform acceptably for the benefit of the interconnection during events involving larger portions of interconnection. As a practical matter, 58 Hz, as average system frequency, is probably a reasonable minimum frequency target for design work, at least for programs that shed 30% load or less. UFLS programs which need to shed more load can increase starting frequencies to improve the minimum frequency to some extent, but may need to accept momentary dips below 58 Hz provided this coordinates with overall generation protection. If this becomes NERC performance criteria, then we anticipate there needs to be a way to allow exceptions when appropriate. **Response:** The SDT believes that 58 Hz is achievable for an imbalance up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. We also have concerns that minimum frequency seen in simulations is quite subjective, it depends on many specific details such as the specific overload level modeled, as well as the assumptions made for load damping, system inertia, UFLS details including total tripping times of load, capacitor tripping, governor response, etc. It is easier at the Regional level to resolve what range of conditions/assumptions/modeling issues need to be considered. **Response:** The SDT agrees that many factors affect simulation performance and need to be worked out by the Planning Coordinators during the design of the UFLS program. If any generators have unreasonable frequency characteristics that can be changed, then the Standard should require them to make appropriate changes. **Response:** This is not the intent of the proposed standard. The SDT believes that the generating equipment limitations should be addressed in the Project 2007-09: Generator Verification PRC-024 because part of the purpose of the standard (as stated in the SAR) is: “To ensure that generators will not trip off-line during specified voltage and frequency excursions.”

Organization	Question 2	Question 2 Comments:
E.ON U.S.	No Revise the design parameter as noted in the comments	See Response to Question 9.
Response: Please see our response to your comment to Question 9.		
Manitoba Hydro	No Revise the design parameter as noted in the comments	While 58 Hz may be appropriate for thermal units, hydro units can operate at lower frequencies. Manitoba Hydro's system is predominantly hydro units, and given our system topology, a 58 Hz cut off is not appropriate to balance our load and generation when our system is separated from the BES. There should be some provision made for systems that are not tightly interconnected with the rest of the BES. Coordination of UFLS and generator protection within the region would then become a very important component of this performance metric.
Response: The basis for the performance characteristics is coordination with generation protection. We agree that hydro units have wider frequency bands, but any island would not necessarily consist only of hydro units. Systems also need to perform acceptably for the benefit of the interconnection during events involving larger portions of an interconnection. The SDT believes that 58 Hz is achievable for an imbalance up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
American Transmission Company	No Revise the design parameter as noted in the comments	With respect to the 25 percentage (Characteristic 4), rather than base UFLS program requirements on system conditions that may have variable underlying assumptions, a better approach might be to specify that UFLS programs be required to shed a minimum percentage of potential island load. **Response:** The SDT has elected to specify the imbalance rather than percentage of load shed so as not to be overly prescriptive on details of UFLS program design and to establish common performance requirements to facilitate coordination between the Planning Coordinators. In addition, the term, "imbalance between load and generation condition", is ambiguous and not clearly defined. Requiring ULFS programs be designed to shed at least a specified percent of potential island load is suggested. We interpret that the phrase "at least" implies that some Regional standards may require a higher percentage for different potential islands depending on the nature of load, generators, protection schemes, and dispatch within the island. **Response:** The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island.

Organization	Question 2	Question 2 Comments:
		With respect to the 58.0 Hz value (Characteristic 4.1), we agree that this value seems reasonable in general. However, for some potential islands the appropriate frequency limit might be higher or lower than 58.0 Hz based on the nature of the load, generators, protection schemes, and dispatch in the island. **Response:** The SDT believes that 58 Hz is achievable for an imbalance up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. An absolute, continent-wide value may not be appropriate. The Characteristics could require that the proper frequency limit be investigated and established for each potential island. The proper frequency limit should be re-examined and changed, if necessary, each time the UFLS program for a potential island is re-assessed. **Response:** The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. Systems also need to perform acceptably for the benefit of the interconnection during events involving larger portions of an interconnection. If any generator limitations cause an unreasonable frequency limit and any of these limitations can be changed, then the Standard should require the Generator Owner to make appropriate changes. **Response:** This is not the intent of the proposed standard. The SDT believes that the generating equipment limitations should be addressed in the Project 2007-09: Generator Verification PRC-024 because part of the purpose of the standard (as stated in the SAR) is: "To ensure that generators will not trip off-line during specified voltage and frequency excursions."
FirstEnergy Corp.	No Revise the design parameter as noted in the comments	The document should be revised to indicate imbalances of "25 percent or less" instead of "at least 25%". If a condition occurred that resulted in a very large imbalance, perhaps much greater than 50%, it may not be possible to arrest the frequency decline to no less than 58 Hz.
Response: The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/(load) of up to 25 percent within the identified island.		
NPCC	Yes	We agree that arresting frequency decline at no less than 58.0 Hz is an appropriate design parameter in most interconnections to ensure coordination with the generator trip requirements to be proposed in PRC-024. However, in some interconnections such as Québec, where generator physical characteristics result in generator underfrequency

Organization	Question 2	Question 2 Comments:
		trip settings below the curve to be proposed in PRC-024, Regional Reliability Standards should be allowed to permit exceptions to this design parameter.
Response: The SDT agrees that provisions for differences for interconnections within a region may be permitted in the form of a Variance as outlined in the NERC Rules of Procedures.		
Bandera Electric Cooperative	Yes	In general, the TRE UFLS SDT believes a UFLS program development for recovery from a frequency excursion in an event that utilizes a 25% contribution within a system allowed to go no further than 58.0 Hz is reasonable. Further, we believe this set of parameters makes sense from the standpoint of the protection of certain equipment from sustained low frequency operation. The parameters are also viewed as essential to the protection of components of low pressure condensing turbines, which are very sensitive to low frequency operation and can quickly develop sub-standard frequency resonance conditions which can lead to catastrophic failures. The TRE UFLS SDT however does question the nature of the wording of the performance criteria "...an imbalance between load and generation of at least 25 percent within an interconnection, region, or identified island(s)" Is the above stated incorrectly? Can the BES remain at a frequency greater than 58.0 Hz with a 25% imbalance between load and generation? Can generation maintain 125% loading without tripping and frequency collapse? Is the statement to imply that 25% of the load should be controlled by UFLS relays? Should the 25% be stated?
Response: The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. Compliance with performance characteristics when the imbalance is greater than 25 % is not required by this standard. The SDT believes that proposed performance characteristics values are achievable for generator deficits up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
PacifiCorp	Yes	Location of generation, load centers and associated transmission interconnections between specific geographical area impact the UFLS study results, especially in WECC region. It would be helpful if RRO would identify credible islands (bubbles) for UFLS studies within RRO and designate responsible parties to conduct overall UFLS studies as per PRC-006. **Response:** Requirement R3 will require the group of Planning Coordinators to develop criteria, considering historical events and system studies, to select portions of the Bulk Electric System that may form islands.
Southwest Power Pool	Yes	Our understanding is that we would continue to use a multi-step UFLS scheme similar to what is being utilized today and that drastic changes to these existing schemes would be avoided.
Response: This in line with the SDT's intent.		

Organization	Question 2	Question 2 Comments:
ERCOT	Yes	Arresting frequency before 58.0Hz for at least 25% load/generation mismatch is a reasonable expectation.
Southwest Power Pool	Yes	The Regional Entity intent is to address the performance characteristics as recommended by the NERC SDT, but not necessarily include those specific characteristics as requirements in the Regional Standard.
Southern Company Services, Inc	Yes	This is a reasonable parameter and apparently coordinates with the most recent thinking of the Generator Verification Standards Drafting Team.
SERC	Yes	This is a reasonable parameter and apparently coordinates with the most recent thinking of the Generator Verification Standards Drafting Team.
Progress Energy Carolinas, Inc.	Yes	This is a reasonable parameter and, based on our understanding, apparently coordinates the most recent thinking of the Generator Verification Standards Drafting Team.
Entergy	Yes	This is a reasonable parameter and apparently coordinates with the most recent thinking of the Generator Verification Standards Drafting Team.
City Water, Light & Power - Springfield, IL	Yes	
Grand River Dam Authority	Yes	
Florida Power & Light	Yes	
Louisiana Generqting, LLC	Yes	
Orrville Utilities	Yes	
Buckeye Power, Inc.	Yes	
Northeast Utilities	Yes	

Organization	Question 2	Question 2 Comments:
We Energies	Yes	
Transmission Reliability Program	Yes	
Independent Electricity System Operator	Yes	
Duke Energy	Yes	
Georgia Transmission Corporation	Yes	

3. As proposed, each regional UFLS standard must require that, for underfrequency conditions resulting from an imbalance between load and generation of at least 25 percent within an interconnection, region, or identified island(s) within or between regions, the UFLS must act such that frequency does not remain below 58.5 Hz for greater than 10 seconds, cumulatively, and frequency does not remain below 59.5 Hz for greater than 30 seconds, cumulatively. Do you agree with this design parameter? If you disagree, please identify whether you believe this design parameter should be deleted or revised.

Summary Consideration:

The Underfrequency Load Shedding drafting team reviewed responses to this question and based on these comments made several conforming and/or clarifying changes to the performance characteristics (now Requirements).

- Many comments indicated that the term "cumulative" either should be removed or clarified because it is not easily tracked on a system level. The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design. The standard does not require measuring compliance for actual events against the standard. The SDT has modified the performance characteristics (Requirement R6) to reflect this. Removal of the word "cumulative" does not preserve the intent of the performance characteristic.
- Several comments offered recommendations to revise the performance characteristic from 59.5 Hz to 59.3 Hz for 30 seconds. The SDT had selected the original performance characteristics to coordinate with typical turbine operating characteristics. Based on these comments the SDT revised the performance characteristics (Requirement R6.2) from 59.5 Hz to 59.3 Hz for 30 seconds while still maintaining coordination with typical turbine operating characteristics.
- Several comments offered recommendations to revise the performance characteristic from 58.4 Hz to 59.4 Hz for up to nine minutes and continuous above 59.4 Hz. Other comments supported the performance characteristic as proposed by the SDT. Based on this support the SDT still proposes 58.5Hz for 10 seconds. The suggested settings do not coordinate with generator under-frequency time durations allowed by manufacturers.
- Some responses to this question indicate that it is more appropriate for the Planning Coordinators associated with the individual regions/islands to decide the appropriate design values, while still coordinating with other regions/islands. These responses indicated that most if not all of the UFLS characteristics can be performed under the auspices of the Planning Coordinator function. The SDT clarifies that the performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. We agree the UFLS design parameters can be devised by the Planning Coordinators and have assigned the Planning Coordinators this responsibility in the proposed standard.

Several responses to this question reiterate concerns regarding coordination with the PRC-024 drafting team expressed in prior questions. The SDT clarifies that it coordinated with the PRC-024 Generator Verification drafting team by providing the generator tripping curves to ensure that the performance characteristics do not conflict with the generator tripping curves.

Several responses to this question reiterate concerns regarding the 25% imbalance (at system peak) expressed in prior questions. The SDT clarifies that the 25% represents the imbalance between load and generation not the amount of load at system peak to be shed. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island.

Organization	Question 3	Question 3 Suggested Revisions:
Grand River Dam Authority	No – Revise the design parameter as noted in the comments	What is the definition of cumulatively? Is this from the start of the event (UF), or is during the previous number of minutes, or from the beginning of time? It would appear that a better choice of a word is in order. **Response:** The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design. The standard does not require measuring compliance for actual events against the standard. The SDT has modified the performance characteristics (Requirement R6) to clarify. What does the load imbalance have to do with the UF decision? You either have UF or you do not, regardless of load imbalance. Or is there an intent to take no action on an UF event if there is a load imbalance less than 25%. **Response:** The SDT's intent is to address imbalances up to and including 25%. It is the SDT's intent to take action for imbalances up to and including 25%.
ERCOT	No – Revise the design parameter as noted in the comments	Operating to these design parameters seems reasonable. However, maybe the NERC standard characteristic should enforce the Region to have a methodology for determining these levels; Regional Standard should have the methodology for setting the levels to be met. Alternatively, the standard characteristic requirement should specify parameters for each Interconnection that are more technically suitable to the characteristic of each Interconnection.
Response: The SDT believes that performance characteristics are achievable for imbalances up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. The performance characteristics are also intended to coordinate with generation characteristics that are common to all interconnections.		
Florida Power & Light	No – Revise the design parameter as noted in the comments	The term cumulatively is not defined. How is this measured? Is this over the time of the event, over the life of equipment i.e. generators etc.
Response: The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design. The SDT has modified the performance characteristics (Requirement R6) to clarify.		

Organization	Question 3	Question 3 Suggested Revisions:
American Electric Power (AEP)	No – Revise the design parameter as noted in the comments	Most UFLS schemes are designed to meet the time requirements proposed by this characteristic if the load/generation imbalance is 25% or less. If the load/generation imbalance is greater than 25%, manual operator intervention (load shedding) may be required to maintain system frequency. An operator can not meet the time requirements outlined by this characteristic. The "at least 25 percent" designation should be changed to "25 percent and below". Any imbalance greater than 25-30% is beyond the scope of most UFLS schemes.
Response: The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. The SDT believes that performance characteristics are achievable for imbalances up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
PPL Generation	No – Revise the design parameter as noted in the comments	See comments to question 1.Some existing generating facilities may have equipment limitations or specific protection issues which force the generator to trip at a frequency levels and operating times that are inconsistent with the characteristic identified above. This can result in a mis-coordination between the UFLS program and the generator protective settings. The above characteristic can be used as the guideline, but provision must be included to allow deviation from the guideline if mis-coordination of UFLS/Generator Frequency protective settings exist and valid technical reasons are provided by a legacy generating facility.
Response: The SDT believes that the generating equipment limitations should be addressed in the Project 2007-09: Generator Verification PRC-024 because part of the purpose of the standard (as stated in the SAR) is: “To ensure that generators will not trip off-line during specified voltage and frequency excursions.” The SDT is coordinating with Project 2007-09: Generator Verification (PRC-024) and will continue to do so as the projects develop.		
Bandera Electric Cooperative	No – Revise the design parameter as noted in the comments	The TRE UFLS SDT recommends the NERC performance criteria be revised from 59.5 Hz to 59.3 Hz. 59.5 Hz is a frequency level that should be supported by high set relays, (59.7 Hz); and when high sets are activated, the next level of intervention should be 59.3 Hz for no more than 30 seconds.
Response: Based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds.		
Midwest ISO	No – Revise the design parameter as noted in the comments	We understand that the 25% stated in the question represents the amount of load at system peak that could be shed by UFLS relays. If our understanding is correct, we support the design parameter and request that the drafting team make it clearer in the characteristics that this is based on system peak load. If not, we request the drafting to change the design parameter to match our understanding.

Organization	Question 3	Question 3 Suggested Revisions:
		Response: The 25% represents the imbalance between load and generation not the amount of load to include in the UFLS program. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. These design parameters should be coordinated with typical turbine operating characteristics. The UFLS relays should shed load to prevent permanent turbine damage. It is our understanding that a typical turbine can operate at 59.5 Hz for 30 minutes rather than 30 seconds without experiencing loss of life. Was the 30 seconds at 59.5 Hz supposed to be 30 minutes? **Response:** The SDT selected the original performance characteristics to coordinate with typical turbine operating characteristics. The SDT did intend on 59.5 Hz for 30 seconds; however, based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds while still maintaining coordination with typical turbine operating characteristics. What does cumulative mean here? Is it the total operating time over a week period, a day, a year, the life of turbine? If the system frequency dips below 59.5 Hz for 15 minutes today and dips below 59.5 Hz tomorrow for 15 minutes, does that mean the UFLS relays should operate? **Response:** The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.
PJM	No – Revise the design parameter as noted in the comments	Please refer to the comment above for question 2. The current draft RFC standard allows the first step of UFLS to begin at 59.3 Hz. Please consider reducing this requirement to 59.3 Hz in the NERC Standard. **Response:** Based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds. When discussing cumulatively, when is the accumulation timer reset: after a minute, an hour, a year? **Response:** The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.
Florida Reliability Coordinating	No – Revise the design parameter as noted in the	Remove of the word “cumulatively” as it is undefined and could be interpreted in several ways, but we think the intent was for a consecutive time. We believe protection engineers would interpret the times as an inclusive time frame and not as a cumulative period beyond the time span given.

Organization	Question 3	Question 3 Suggested Revisions:
Council	comments	**Response**: The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design. The context of the phrase “identified island” requires clarification. (See comments for Question No. 2.) **Response:** See response to question No. 2
Florida Power & Light Co.	No – Revise the design parameter as noted in the comments	The meaning of the term cumulatively in this context is unclear. If redefined as specific to one event, it would still be an unnecessary qualifier that would be difficult to apply. Remove the term cumulatively
Response: The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.		
Exelon	No – Revise the design parameter as noted in the comments	RFC has determined and included in its draft standard that the first step of the UFLS program may be at 59.3 Hz. Please change the parameter to include RFC level.
Response: Based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds.		
Progress Energy Carolinas, Inc.	No – Revise the design parameter as noted in the comments	This design parameter is appropriate except for the requirement to "not remain below 59.5 Hz for greater than 30 seconds." Relatively quick recovery above 58.5 is appropriate to minimize the possibility of generator trips. However, at 59.5 Hz, the possibility of generator trips is greatly reduced and a more reasonable recovery time should be allowed. Recommend this be changed to "not remain below 59.5 Hz for greater than 5 minutes." ANSI standard 37.106-2003 indicates that 59.5 Hz for 5 minutes provides adequate margin above typical generator damage curves. This change will help reduce the potential for overshoot while still providing sufficient margin. **Response:** Based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds while still maintaining coordination with typical turbine operating characteristics. Additionally, the word "cumulatively" (in Characteristics 4.3 and 4.4) should be removed. Cumulatively refers more to "cumulative machine damage" and is not easily tracked on a system level (nor is it necessary on a system level). **Response:** Removal of the word “cumulative” does not preserve the intent of the performance characteristic. Instead, the SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS

Organization	Question 3	Question 3 Suggested Revisions:
		program design.
Ameren	No – Revise the design parameter as noted in the comments	We believe that the proposed time for underfrequency operation is too restrictive. The proposed time of 30 seconds of operation at 59.5 Hz does not provide the system operators with enough time to attempt to bring generation on-line to remedy the frequency undershoot. Based on our practices, tripping of generation at 59.5 Hz is not necessary and if implemented may further exacerbate the frequency decline conditions. We agree that underfrequency operation is neither optimum nor desired, but the system needs to hold together as long as possible to be able to implement operational solutions. We suggest that the SDT to quantify the risks, including appropriate review of existing (not proposed) IEEE, ANSI and other standards, associated with operating the generating equipment at 59.5 Hz (0.992 p.u.) for more than 30 seconds to support their recommendation. **Response:** The intent of the load shedding program is to stabilize frequency automatically prior to operator intervention. We agree that tripping generation may further exacerbate conditions. The SDT believes that the generating equipment limitations should be addressed in the Project 2007-09: Generator Verification PRC-024 because part of the purpose of the standard (as stated in the SAR) is: "To ensure that generators will not trip off-line during specified voltage and frequency excursions." The SDT is coordinating with Project 2007-09: Generator Verification (PRC-024) and will continue to do so as the projects develop. We also suggest the SDT to clearly define the term "cumulatively"; For example, is it per event, per life of the equipment, or something else? **Response:** The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.
Alliant Energy	No – Revise the design parameter as noted in the comments	The system performance (Requirement 4) prescribed by the SDT is based on typical values and their engineering judgment, and do not reflect how individual systems (or islands) were planned and designed (and what were/are deemed as acceptable risks). We believe it more appropriate for the Planning Coordinators associated with the individual regions/islands to decide what are the appropriate design values (for 4.1 to 4.4), while still coordinating with other regions/islands. We also believe most if not all of the UFLS characteristics can be performed under the auspices of the Planning Coordinator function. **Response:** The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. We agree the UFLS design parameters can be devised by the Planning Coordinators and have assigned the Planning Coordinators this responsibility in the proposed standard.

Organization	Question 3	Question 3 Suggested Revisions:
		We do not agree with the specified maximum operating times associated with the specified off-nominal frequencies. The proposal to limit time below 59.5 Hz and above 60.5 Hz to 30 seconds looks like a typo. 59.5 Hz to 60.5 Hz is the range where units can run continuously with no accelerated loss of life. Perhaps “30 seconds” should have read “30 minutes” which is still only 66% of the time specified by the MRO program for f <= 59.5 Hz. As written, the proposed criteria for time spent below 59.5 Hz and above 60.5 Hz is unacceptable. The MRO UFLS report states that generation protection cannot trip any quicker than shown below, and that utilities that need to shed more than 30% of connected load will have to relax these times to allow their load shedding to play out. MRO generation protection time delay requirement: 45 minute, frequency <=59.5 Hz? 5 minute, frequency <= 59.3 Hz? 1.33 minute, frequency <= 59 Hz? 30 second, frequency <= 58.4 Hz? 7.5 second, frequency <= 58.0 Hz? instant trip at 57.6 Hz In the MRO UFLS study simulations, we estimated our worst-case time below 58.5 Hz would be approximately 9 seconds. Of course, this has to be qualified by saying “for our given assumptions”. These types of simulations only give approximate results. The proposal to limit time below 58.5 Hz to 10 seconds is going to be tight for a program which sheds more than 30% load. What we assume for governor action will have considerable effect on how much time is spent below 58.5 Hz. The MRO tried to design a program that will ensure frequency recovery even if we get no net governor response. The MRO study looked at a range of imbalances that an UFLS program has to respond to, and factored in uncertainties. 100?s of cases were run to cover a range of imbalances, range of damping assumptions, and a range of system based inertia. In looking at all of the results in total, the resulting time spent below a given frequency took on the form of a probability density function. Typical times below a given frequency are perhaps more representative of what the typical exposure is for generation. However we coordinated generation protection according to the worst case times with enough margin to provide a degree of comfort. The actual loss of life a generator will be exposed to for some arbitrary UFLS event will most often be less than what these generator protection trip settings reflect as the first line of defense is the load shedding program itself. Under most circumstances, we will never spend enough time in the frequency trip bands to actually trip generation. To view the full report of the MRO UFLS please see the MRO website:http://www.midwestreliability.org/03_reliability/assessments/report_draft_03_12_final_clean.pdf **Response:** The SDT selected the original performance characteristics to provide coordination with typical turbine operating

Organization	Question 3	Question 3 Suggested Revisions:
		characteristics. SDT did intend on 59.5 Hz for 30 seconds; however, based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds while still maintaining coordination with typical turbine operating characteristics.
E.ON U.S.	No – Revise the design parameter as noted in the comments	See Response to Question 9.
Response: Please see our response to your comment to Question 9.		
Manitoba Hydro	No – Revise the design parameter as noted in the comments	Manitoba Hydro echo's the MRO's concerns: "The system performance (Requirement 4) prescribed by the SDT is based on typical values and their engineering judgment, and do not reflect how individual systems (or islands) were planned and designed (and what were/are deemed as acceptable risks). We believe it more appropriate for the Planning Coordinators associated with the individual regions/islands to decide what are the appropriate design values (for 4.1 to 4.4), while still coordinating with other regions/islands. We also believe most if not all of the UFLS characteristics can be performed under the auspices of the Planning Coordinator function. "
Response: The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. We agree the UFLS design parameters can be devised by the Planning Coordinators and have assigned the Planning Coordinators this responsibility in the proposed standard.		
CenterPoint Energy	No – Delete the design parameter	As stated previously, CenterPoint Energy believes this effort should be postponed. Alternatively, this proposed design parameter should be deleted until coordination with the PRC-024 drafting team can be firmly established. **Response:** The SDT coordinated with the PRC-024 Generator Verification Standard Drafting Team (GV SDT) by providing the generator underfrequency performance curve to ensure that the performance characteristics do not conflict with the generator off nominal capability curve. The SDT will continue to coordinate with the GV SDT and we believe it does not matter whether PRC-006 or PRC-024 is approved first as long as this coordination exists. If the design parameter is not deleted, CenterPoint Energy recommends the following values to place proper balance and emphasis on system reliability as system performance can vary widely depending upon system load and the composition of assumed on-line generation under various conditions: 58.4 Hz to 59.4 Hz for up to 9 minutes and continuous above 59.4 Hz. **Response:** Based on industry support the SDT still proposes 58.5Hz for 10 seconds. The suggested settings do not coordinate with generator under-frequency time durations allowed by manufacturers. Based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds while still

Organization	Question 3	Question 3 Suggested Revisions:
		maintaining coordination with typical turbine operating characteristics.
FirstEnergy Corp.	No – Revise the design parameter as noted in the comments	1. Although we agree that there needs to be a low set-point duration of no greater than 10 seconds for frequencies below 58.5 Hz, we are not sure if the appropriate first set-point should be set at 59.5 Hz. Some systems may be able to function reliably at 59.4 Hz for more than 30 seconds, so we ask the SDT to investigate this or provide the technical rationale for choosing 59.5 Hz. **Response:** Based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds while still maintaining coordination with typical turbine operating characteristics. 2. When using the term "cumulatively" in this characteristic, when is the accumulation timer reset: a minute, an hour, a year? We are not clear if this is based on a design parameter or an "after-the-fact" performance review. We ask the SDT to provide clarification on this term. **Response:** The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design. 3. As stated previously, the document should be revised to indicate imbalances of "25 percent or less" instead of "at least 25%". The design parameters would not be achievable if an extremely high imbalance occurred. **Response:** The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/(load) of up to 25 percent within the identified island.
Entergy	No	Entergy experiences some under-frequency relay trips due to transient contributions from induction motors with UF relays set to trip at 59.3 Hz. Relay trip settings at 59.5 Hz will increase the likelihood of these nuisance trips with attendant two-hour restart times for large commercial / industrial loads. We suggest the 59.5 Hz, 30 second, requirement is an overly restrictive requirement and we believe the setting should be lowered to at least 59.3 Hz. Lowering this requirement will give regions greater latitude when developing the design requirements of their standard.
Response: Based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds while still maintaining coordination with typical turbine operating characteristics.		
American Transmission	No – Revise the design parameter	With respect to the 25 percentage (Characteristic 4), refer to comments for Question 2. **Response**: The SDT has elected to specify the imbalance rather than percentage of load shed so as not to be overly

Organization	Question 3	Question 3 Suggested Revisions:
Company	as noted in the comments	prescriptive on details of UFLS program design and to establish common performance requirements to facilitate coordination between regions. With respect to the 10-second and 30-second underfrequency values (Characteristic 4.2), these values may be reasonable in general. However, for some potential islands the appropriate frequency limits might be higher or lower based on the nature of the load, generators, protection schemes, and dispatch in the island. Absolute, continent-wide values may not be appropriate. The Characteristics could require that the proper frequency limits be investigated and established for each potential island. The proper frequency limit should be re-examined and changed, if necessary, each time the UFLS program for a potential island is re-assessed. **Response:** The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. Systems also need to perform acceptably for the benefit of the interconnection during events involving larger portions of an interconnection. If any generator limitations cause an unreasonable frequency limit and any of these limitations can be changed, then the Standard should require the Generator Owner to make appropriate changes. **Response:** This is not the intent of the proposed standard. The SDT believes that the generating equipment limitations should be addressed in the Project 2007-09: Generator Verification PRC-024 because part of the purpose of the standard (as stated in the SAR) is: "To ensure that generators will not trip off-line during specified voltage and frequency excursions."
Indiana Municipal Power Agency	No – Revise the design parameter as noted in the comments	The term cumulatively is confusing. It either needs to be clarified or removed.
Response: Removal of the word "cumulative" does not preserve the intent of the performance characteristic. Instead, the SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.		
Duke Energy	No – Revise the design parameter as noted in the comments	The time frames stated in these criteria seem overly conservative. Thirty seconds at 59.5 Hz would likely create expensive and unnecessary relay setting changes. Recommend changing the requirement to "59.5 Hz for greater than 5 minutes." **Response:** Based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds while still maintaining coordination with typical turbine operating characteristics.

Organization	Question 3	Question 3 Suggested Revisions:
		The Generator Verification SDT (PRC-024) is evaluating the appropriate envelope for protection of generator equipment. The envelope established by these criteria must be coordinated with generator protection envelope. **Response:** The SDT believes that the generating equipment limitations should be addressed in the Project 2007-09: Generator Verification PRC-024 because part of the purpose of the standard (as stated in the SAR) is: "To ensure that generators will not trip off-line during specified voltage and frequency excursions." The SDT is coordinating with Project 2007-09: Generator Verification (PRC-024) and will continue to do so as the projects develop. The word "cumulatively" is confusing in this context. Since this is generally related to equipment and not system studies, recommend deleting "cumulatively" from the requirements. **Response:** The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.
PacifiCorp	Yes	same comment as item 2 to identify UFLS study bubble by RRO. Location of generation, load centers and associated transmission interconnections between specific geographical area impact the UFLS study results, especially in WECC region. It would be helpful if RRO would identify credible islands (bubbles) for UFLS studies within RRO and designate responsible parties to conduct overall UFLS studies as per PRC-006.
Response: Requirement R3 will require the group of Planning Coordinators to develop a procedure to investigate and locate portions of the Bulk Electric System that may form islands including how historical events and system studies were considered.		
Southwest Power Pool	Yes	The Regional Entity intent is to address the performance characteristics as recommended by the NERC SDT, but not necessarily include those specific characteristics as requirements in the Regional Standard.
Response: The SDT confirms that this was the original intent; however, the SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard that requires the Planning Coordinators to design UFLS programs that adhere to the performance characteristics (Requirement R6).		
Southern Company Services, Inc	Yes	No Additional Comment.
Louisiana Generqting,	Yes	

Organization	Question 3	Question 3 Suggested Revisions:
LLC		
Orrville Utilities	Yes	
City Water, Light & Power - Springfield, IL	Yes	
NPCC	Yes	
SERC	Yes	
Buckeye Power, Inc.	Yes	
Northeast Utilities	Yes	
We Energies	Yes	
Transmission Reliability Program	Yes	
Independent Electricity System Operator	Yes	
Georgia Transmission Corporation	Yes	

4. As proposed, each regional UFLS standard must require that, for underfrequency conditions resulting from an imbalance between load and generation of at least 25 percent within an interconnection, region, or identified island(s) within or between regions, the UFLS must act such that the frequency overshoot resulting from operation of UFLS relays will not exceed 61.0 Hz for any duration and will not exceed 60.5 Hz for greater than 30 seconds, cumulatively. Do you agree with this design parameter? If you disagree, please identify whether you believe this design parameter should be deleted or revised.

Summary Consideration:

The UFLS Standard Drafting team reviewed comments to this question and made several conforming changes to the performance characteristics (now requirements).

- Numerous industry comments indicated that while this design parameter is appropriate as an overall system design obective the limits are overly restrictive and do not appear to coordinate with any equipment limitations. Based on these comments the SDT adjusted the characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).

- Several industry comments indicated that operating to these parameters appears reasonable; however, it would be preferrable if the SDT specify parameters for each interconnection that are more technically suitable to the characteristic of each interconnection. The SDT clarifies that the performance characteristics are intended to coordinate with generation characteristics that are common to all interconnections. In addition, the SDT believes that the performance characteristics are achieveable for imbalances up to and including 25%. For deficiencies up to 25% these performance characteristics must be met; however, for deficiencies exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.

- Several industry comments indicated that “cumulative” needs clarification. The SDT clarifies that cumulative is “per event simulated” to verify that the performance characteristics are achieved by the UFLS program design. Various requirements were modified to reflect that cumulative is per event simulated.

- Several industry comments suggested that a mimium size of the postulated island should be specified and it should be of sufficient size to affect the Bulk Electric System and there should be a distinction with differing requirements between the entire Eastern Interconnection and a potential frequency overshoot in a much smaller identified island. The SDT believes that the UFLS programs must be designed such that all interconnected systems will meet common performance characteristics. Common performance characteristics facilitate coordination between regions. An island could be subject to other performance characteristics in addition to the common performance characteristics for imbalances greater than 25% if the Regional Entities develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. In addition, the SDT clarified requirements concerning identification of islands in Requirements R3, R4, and R5. The SDT disagrees that there should be a size specification for islands, but has modified the requirement to apply to islands

containing portions of the Bulk Electric System. The islands identified should be able to meet the performance characteristics for the given conditions.

Organization	Question 4	Question 4 Suggested Revisions:
NPCC	No – Revise the design parameter as noted in the comments	We agree this design parameter is appropriate as an overall system design objective. However, this objective cannot be met through the UFLS program design alone in the absence of adequate generating unit governing response. We recommend that applicability of this design parameter be limited to islands that exhibit a frequency response of at least 1 percent of peak island load per 0.1 Hz.
Response: Rather than changing applicability of this performance characteristic, the SDT adjusted the characteristic. Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds.		
ERCOT	No – Revise the design parameter as noted in the comments	Operating to these design parameters seems reasonable. However, maybe the NERC standard characteristic should enforce the Region to have a proof of methodology of determining these levels, Regional Standard should have the methodology for setting the levels to be met. Alternatively, the standard characteristic requirement should specify parameters for each Interconnection that are more technically suitable to the characteristic of each Interconnection. In addition to the comment; does the NERC SDT have supporting documentation for restricting frequency overshoot to 61Hz? Request NERC Generation Verification SDT for reasoning/explanation.
Response: The SDT believes that performance characteristics are achievable for imbalances up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. The performance characteristics are also intended to coordinate with generation characteristics that are common to all interconnections. Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).		
Florida Power & Light	No – Revise the design parameter as noted in the comments	Cumulatively needs to be defined. Is this cumulative over the event, cumulatively over the life of the equipment? The 61Hz and 60.5Hz limits are overly restrictive and do not appear to coordinate with any equipment limitations

Organization	Question 4	Question 4 Suggested Revisions:
Response: The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design. Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).		
American Electric Power (AEP)	No – Revise the design parameter as noted in the comments	UFLS schemes are designed to account for frequency overshoot by breaking the UFLS scheme up into separate steps (verified by dynamic simulation). Is the intent of this characteristic to specify parameters for the amount of load included in each UFLS step and/or to specify parameters for unit overspeed trip settings? Clarification is needed not only for the intent of this characteristic but also regarding the foundation of the timing requirements. In addition, the "at least 25 percent" designation should be changed to "25 percent and below". Any imbalance greater than 25-30% is beyond the scope of most UFLS schemes.
Response: Unit overspeed trip relay settings are to be limited according to PRC-024. The UFLS performance characteristics are intended to coordinate with PRC-024 in order to prevent unnecessary loss of generation. Timing requirements need to be specified by the group of Planning Coordinators to prevent frequency overshoot above the performance characteristic values. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. The SDT believes that performance characteristics are achievable for imbalances up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
PPL Generation	No – Revise the design parameter as noted in the comments	See comments to question 1.Some existing generating facilities may have equipment limitations or specific protection issues which force the generator to trip at a frequency levels and operating times that are inconsistent with the values identified above. This can result in a mis-coordination between the UFLS program and the generator protective settings. The above characteristic can be used as the guideline, but provision must be included to allow deviation from the guideline if mis-coordination of UFLS/Generator Frequency protective settings exist and valid technical reasons are provided by a legacy generating facility.
Response: The SDT believes that the generating equipment limitations should be addressed in the Project 2007-09: Generator Verification PRC-024 because part of the purpose of the standard (as stated in the SAR) is: “To ensure that generators will not trip off-line during specified voltage and frequency excursions.” The SDT is coordinating with Project 2007-09: Generator Verification (PRC-024) and will continue to do so as the projects develop.		
Bandera Electric Cooperative	No – Delete the design parameter	The TRE UFLS SDT believes that the NERC standard should not define the frequency overshoot limit; instead, the NERC standard should state this as a requirement for the region to establish as part of a regional UFLS standard. For example, the NERC standard might state as follows: "The Regional Standard shall define the frequency overshoot it

Organization	Question 4	Question 4 Suggested Revisions:
		determines appropriate in arresting the imbalance between load and generation."
Response: The performance characteristics are intended to coordinate with generation characteristics that are common to all interconnections. The UFLS design parameters can be devised by the Planning Coordinator(s) and the SDT has assigned the Planning Coordinators this responsibility in the proposed standard.		
Louisiana Generqting, LLC	No – Revise the design parameter as noted in the comments	61Hz and 60.5Hz limits are overly restrictive and do not appear to coordinate with any equipment limitations
Response: Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).		
Midwest ISO	No – Revise the design parameter as noted in the comments	We understand that the 25% stated in the question represents the amount of load at system peak that could be shed by UFLS relays. If our understanding is correct, we support the design parameter and request that the drafting team make it clearer in the characteristics that this is based on system peak load. If not, we request the drafting to change the design parameter to match our understanding. **Response:** The 25% represents the imbalance between load and generation not the amount of load to include in the UFLS program. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. These design parameters should be coordinated with typical turbine operating characteristics. If a turbine can operate at 60.5 Hz for 30 minutes before experiencing any loss of life, the design parameters should reflect this. It is our understanding that a typical turbine can operate at 60.5 Hz for 30 minutes rather than 30 seconds without experiencing loss of life. Was the 30 seconds at 60.5 Hz supposed to be 30 minutes? **Response:** The SDT selected the original performance characteristics to provide coordination with typical turbine operating characteristics. Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).
Southern	No – Revise the	These parameters are overly restrictive. We recommend to change the statement to "will not exceed 61.5 Hz for any

Organization	Question 4	Question 4 Suggested Revisions:
Company Services, Inc	design parameter as noted in the comments	duration and will not exceed 60.5 Hz for greater than 5 minutes?" A frequency of 61.8 Hz results in a 3% generator overspeed, which should be avoided. An absolute limit of 61.5 Hz provides an adequate margin. ANSI standard 37.106-2003 indicates that 60.5 Hz for 5 minutes provides adequate margin below generator damage curves. Our proposed parameters allow time for generator governors to operate and for some load restoration to correct overshoot.
Response: Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).		
PJM	No – Revise the design parameter as noted in the comments	"for any duration" is too difficult to meet. Substitute with a short time frame.
Response: Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).		
Florida Reliability Coordinating Council	No – Revise the design parameter as noted in the comments	The 61.0 hertz ceiling for frequency recovery seems too low. Is there any technical justification for this level? A more appropriate limit might be 61.8 hertz due to the number of governing systems that initiate auxiliary governor action at 103% overspeed. **Response:** Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that are developing generator requirements (PRC-024). Remove of the word “cumulatively”. (See comments for Question No. 3.) **Response:** Removal of the word “cumulative” does not preserve the intent of the performance characteristic. Instead, the SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design. The context of the phrase “identified island” requires clarification. (See comments for Question No. 2.) **Response:** See our response to question No. 2

Organization	Question 4	Question 4 Suggested Revisions:
SERC	No – Revise the design parameter as noted in the comments	These parameters are overly restrictive. We recommend to change the statement to "will not exceed 61.5 Hz for any duration and will not exceed 60.5 Hz for greater than 5 minutes?" A frequency of 61.8 Hz results in a 3% generator overspeed, which should be avoided. An absolute limit of 61.5 Hz provides an adequate margin. ANSI standard 37.106-2003 indicated that 60.5 Hz for 5 minutes provides adequate margin below generator damage curves. Our proposed parameters allow time for generator governors to operate and for some load restoration to correct overshoot.
Response: Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).		
Entergy	No	We agree with and support the SERC comments.
Response: Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).		
Northeast Utilities	No – Revise the design parameter as noted in the comments	We do not believe all generator controls are sufficiently responsive to enable this design parameter. A longer response time may be needed, or a significant improvement in governing response for connected generators.
Response: Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).		
Florida Power & Light Co.	No – Revise the design parameter as noted in the comments	A technical justification of the proposed over frequency limits does not appear to be posted with the generator verification SDT information. A target over frequency limit of 61.8 hertz is used within the FRCC. The 61.0 hertz and 60.5 hertz for 30 seconds appear to be unnecessarily low. **Response:** Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that are developing generator requirements (PRC-024). The words at least 25% should be replaced with up to 25% for the reasons discussed above.

Organization	Question 4	Question 4 Suggested Revisions:
		Response: The 25% represents the imbalance between load and generation not the amount of load to include in the UFLS program. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. The word cumulatively should be removed. **Response:** Removal of the word "cumulative" does not preserve the intent of the performance characteristic. Instead, the SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.
Exelon	No – Revise the design parameter as noted in the comments	There should be a distinction and differing requirements between the entire Eastern Interconnection and a potential frequency overshoot in a much smaller identified island. Also, the minimum size of the postulated island should be specified here. It should be of sufficient size to affect the bulk electric system.
Response: The UFLS program must be designed such that all interconnected systems will meet common performance characteristics. Common performance characteristics facilitate coordination between regions. An island could be subject to other performance characteristics in addition to the common performance characteristics for imbalances greater than 25% if the Regional Entities develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. The SDT has clarified requirements concerning identification of islands in Requirements R3, R4 and R5. The SDT disagrees that there should be a size specification for islands, but has modified the requirement to apply to islands containing portions of the Bulk Electric System. The islands identified should be able to meet the performance characteristics for the given conditions.		
Progress Energy Carolinas, Inc.	No – Revise the design parameter as noted in the comments	These parameters are overly restrictive. We recommend to change the statement to "will not exceed 61.5 Hz for any duration and will not exceed 60.5 Hz for greater than 5 minutes?" A frequency of 61.8 Hz results in a 3% generator overspeed, which should be avoided. An absolute limit of 61.5 Hz provides an adequate margin. ANSI standard 37.106-2003 indicated that 60.5 Hz for 5 minutes provides adequate margin below generator damage curves. Our proposed parameters allow time for generator governors to operate and for some load restoration to correct overshoot.
Response: Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).		
Ameren	No – Revise the design parameter	We believe that these over frequency parameters are overly restrictive. We suggest that the SDT to quantify the risks, including appropriate review of existing (not proposed) IEEE, ANSI and other standards, associated with operating the

Organization	Question 4	Question 4 Suggested Revisions:
	as noted in the comments	generating equipment above 60.5 Hz for more than 30 seconds to support their recommendation. We also suggest the SDT to clearly define the term "cumulatively"; For example, is it per event, per life of the equipment, or something else?
Response: Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024). The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.		
Alliant Energy	No – Revise the design parameter as noted in the comments	This a subjective performance criteria as modeling details such as load damping assumptions, inertia assumptions, and governor response assumption will all have considerable effect on performance. This type of performance objective is best evaluated and determined at the Regional level or some mechanism needs to be in place to allow aggressive load shedding programs some latitude on this. **Response:** The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. There are cases where overshoots above 61 Hz could be accepted for short periods. The type of units in the island also have to be considered. Hydro systems have fewer off-nominal frequency restrictions. The 30 second time limit for operating above 60.5 Hz is not at all appropriate. Units can operate continuously at 60.5 Hz with no accelerated loss of life. They can run slightly above this for a long time. Could this be a typo? Was the intention to establish at 30 minute limit? **Response:** Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).
E.ON U.S.	No – Revise the design parameter as noted in the comments	See Response to Question 9.
Response: Please see our response to your comment to Question 9.		
Manitoba Hydro	No – Revise the design parameter	Again, Manitoba Hydro echo's the MRO's concerns. Each region should determine the maximum overshoot based on

Organization	Question 4	Question 4 Suggested Revisions:
	as noted in the comments	its system topology, how it was planned and designed and the region's requirements.
Response: The performance characteristics are intended to coordinate with generation characteristics that are common to all interconnections and ensure coordination among the programs the Planning Coordinators are required to design. The UFLS design parameters can be devised by the Planning Coordinator(s) and the SDT has assigned the Planning Coordinators this responsibility in the proposed standard.		
CenterPoint Energy	No – Delete the design parameter	As stated previously, CenterPoint Energy believes this effort should be postponed. Alternatively, this proposed design parameters should be deleted until coordination with the PRC-024 drafting team can be firmly established. If the design parameter is not deleted, CenterPoint Energy recommends a value of 61.5 Hz instead of 61.0 Hz to place proper balance and emphasis on system reliability as system performance can vary widely depending upon system load and the composition of assumed on-line generation under various conditions.
Response: Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that are developing generator requirements (PRC-024).		
FirstEnergy Corp.	No – Delete the design parameter	1. When using the term "cumulatively" in this characteristic, when is the accumulation timer reset: a minute, an hour, a year? We are not clear if this is based on a design parameter or an "after-the-fact" performance review. We ask the SDT to provide clarification on this term. **Response:** The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design. 2. We recommend that this design parameter be deleted. We feel that the characteristic is overly prescriptive. Although frequency overshoot may be a concern in some regions, it is not in all regions. In many regions the generators would automatically re-adjust to lower frequency. **Response:** This is a concern for all islands and interconnected systems. The requirement (Requirement R6.3) ensures coordination with the UFLS program and generator limitations. Governing response to over-frequency conditions should be accounted for in the design of the UFLS program.
American Transmission	No – Revise the design parameter as noted in the	With respect to the 25 percentage (Characteristic 4), refer to comments for Question 2. **Response:** The SDT has elected to specify the imbalance rather than percentage of load shed so as not to be overly

Organization	Question 4	Question 4 Suggested Revisions:
Company	comments	prescriptive on details of UFLS program design and to establish common performance requirements to facilitate coordination between regions. With respect to the continuous and 30-second overfrequency values (Characteristic 4.3), these values may be reasonable in general. However, for some potential islands the appropriate frequency limits might higher or lower based on the nature of the load, generators, protection schemes, and dispatch in the island. Absolute, continent-wide value may not be appropriate. The Characteristics could require that the proper frequency limit be investigated and established for each potential island. The proper frequency limit should be re-examined and changed if necessary each time the UFLS program for a potential island is re-assessed. If any generator limitations cause an unreasonable frequency limit and any of these limitations can be changed, then the Standard should require the Generator Owner to make appropriate changes. **Response:** The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. Systems also need to perform acceptably for the benefit of the interconnection during events involving larger portions of an interconnection.
Indiana Municipal Power Agency	No – Revise the design parameter as noted in the comments	The term cumulatively is confusing. It either needs to be clarified or removed.
Response: The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.		
Duke Energy	No – Revise the design parameter as noted in the comments	These parameters seem too restrictive. Recommend changing the statement to "will not exceed 61.5 Hz for any duration and will not exceed 60.5 Hz for greater than 5 minutes?" This is recommended because a frequency of 61.8 Hz is a 3% generator overspeed, which should be avoided. An absolute limit of 61.5 Hz provides an adequate margin. Also, ANSI standard 37.106-2003 indicated that 60.5 Hz for 5 minutes provides adequate margin below generator damage curves. The recommended parameter changes allow time for generator governors to operate and for some load restoration to correct overshoot.
Response: Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024).		
Southwest Power	Yes	The Regional Entity intent is to address the performance characteristics as recommended by the NERC SDT, but not

Organization	Question 4	Question 4 Suggested Revisions:
Pool		necessarily include those specific characteristics as requirements in the Regional Standard.
Response: The SDT confirms that this was the original intent; however, the SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard that requires the Planning Coordinators to design UFLS programs that adhere to the performance characteristics (Requirement R6).		
We Energies	Yes	
Buckeye Power, Inc.	Yes	
Orrville Utilities	Yes	
City Water, Light & Power - Springfield, IL	Yes	
Grand River Dam Authority	Yes	
PacifiCorp	Yes	
Transmission Reliability Program	Yes	
Independent Electricity System Operator	Yes	
Georgia Transmission Corporation	Yes	

5. As proposed, each regional UFLS standard must require that, for underfrequency conditions resulting from an imbalance between load and generation of at least 25 percent within an interconnection, region, or identified island(s) within or between regions, the UFLS must act such that the Bulk Electric System voltage during and following UFLS operations is controlled such that the per unit Volts per Hz (V/Hz) does not exceed 1.18 for longer than 6 seconds cumulatively, and does not exceed 1.10 for longer than 1 minute cumulatively. Do you agree with this design parameter? If you disagree, please identify whether you believe this design parameter should be deleted or revised.

Summary Consideration:

The UFLS Standard Drafting team reviewed comments to this question and made several conforming changes to the performance characteristics (now requirements). In addition, the team considered the comments and provided clarifying responses.

- Several comments expressed concern that this performance characteristic is out of place because as load is rejected to correct the frequency problem the voltage should climb. The SDT clarifies that they feel it is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.
- Several comments expressed concern that the underfrequency relays are not monitored or supervised by a volts/ hertz element and do not operate or block based on the Volts / hertz. The underfrequency relays typically do have undervoltage blocking which will block underfrequency relay operation for low voltage, but the UFLS relays have no capability to control voltage. Therefore, the UFLS relays cannot control voltage level or volts/ hertz and this requirement should be omitted from the UFLS standard characteristics.The SDT agrees with the comment; however, the intent is that over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances.
- Comments expressed confusion regarding whether this is a planning characterisitc for simulation of the UFLS or a post event measurement for compliance. The SDT clarified that this is a planning characteristic for simulation based design verification studies. It is not a post-event measurement for compliance. The proposed standard has been modified to clarify this point.
- Several comments indicated that the standard characteristic requirement should specify how to determine to which buses these voltage requirements apply for each Interconnection, at a minimum, and preferably for each Region. The SDT made a clarifying change to Requirement R6.4 which further specifies the locations to which these voltage requirements apply.

Organization	Question 5	Question 5 Suggested Revisions:
Grand River Dam Authority	No – Revise the design parameter as noted in the comments	This seems to be out of place in an UFLS scheme and may belong in an OV scheme. As load is rejected to correct the frequency problem, the voltage should climb. The generators, with the VRs, may or may not see the problem. This seems more like a hope than an item that someone can accomplish. Studies may indicate that there is no problem. But if they show a problem, what can be done? Install shunt reactors which may not help the frequency problem????
Response: It is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.		
ERCOT	No – Revise the design parameter as noted in the comments	Is this just a planning characteristic for simulation of the UFLS, or a post event measurement for compliance? If it is included in the post event compliance analysis then it needs to be more specific on what voltage(s) are to be measured and meet the design parameters. Is it every Bus Voltage in the BES? Or a subset of critical buses for measurement? **Response:** This is a planning characteristic for simulation based design verification studies. It is not a post-event measurement for compliance. The proposed standard has been modified to clarify this point. Perhaps the NERC Standard Characteristic requests that each Region establish a methodology for determining a list of critical buses and these bus voltages are to be used for the UFLS and post event compliance analysis. Alternatively, the standard characteristic requirement should specify how to determine to which buses these voltage requirements apply for each Interconnection, at a minimum, and preferably for each Region. **Response:** The SDT modified Characteristic 4.4 (Requirement R6.4) to further specify the location (Requirements R6.4.1 and R6.4.2).
Florida Power & Light	No – Revise the design parameter as noted in the comments	The term cumulatively needs to be defined
Response: The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.		
American Electric Power (AEP)	No – Delete the design parameter	The foundation of the timing requirements needs to be clarified. **Response:** The technical basis for the performance characteristics was developed through a review of relevant

Organization	Question 5	Question 5 Suggested Revisions:
		industry standards that include voltage and frequency limits for major electrical equipment. The performance characteristics were selected to prevent equipment damage and to coordinate with generating unit protection. The SDT included more details regarding the technical justification for the performance characteristics in the comment form background (including specific IEEE standards). In addition, the "at least 25 percent" designation should be changed to "25 percent and below". Any imbalance greater than 25-30% is beyond the scope of most UFLS schemes. **Response:** The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island.
Southwest Power Pool	No – Delete the design parameter	The UFLS system consists of underfrequency relays. The underfrequency relays are not monitored or supervised by a volts/ hertz element and do not operate or block based on the Volts / hertz. The underfrequency relays typically do have under voltage blocking which will block underfrequency relay operation for low voltage, but the UFLS relays have no capability to control voltage. Therefore, the ufls relays cannot control voltage level or volts/ hertz and this requirement should be omitted from the UFLS standard characteristics.
Response: The SDT agrees with the comment; however, the intent is that over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances.		
Bandera Electric Cooperative	No – Revise the design parameter as noted in the comments	The TRE UFLS SDT feels that, due to the interplay between load and generation components during a firm load shedding event, it would seem impractical to decompose their individual contributions to the volts/Hz ratio; therefore, compliance enforcement would likely prove to be impossible. **Response:** This is a planning characteristic for simulation based design verification studies. It is not a post-event measurement for compliance. The TRE UFLS SDT feels that the NERC standard should not specify the relay coordination requirements with generation protection relays. Instead, the NERC standard should state as a requirement for each region to establish as part of the UFLS standard a planning study to determine adequacy and consistency with other standards. For example, the NERC standard might state as follows: "The Regional Standard shall address the requirement for the UFLS to coordinate with existing regional generation relaying requirements." As written, the proposed performance criteria may conflict with ERCOT's Operating Guide 3.1.4.6 where v/Hz is specified. **Response:** The UFLS program must be designed such that all interconnected systems will meet common

Organization	Question 5	Question 5 Suggested Revisions:
		performance characteristics. The SDT acknowledges that ERCOT 3.1.4.6 (1.16 pu v/Hz for 1.5 seconds); is more conservative than the proposed performance characteristic (Requirement R6.4).
Louisiana Generqting, LLC	No – Revise the design parameter as noted in the comments	the interplay between the generation control and the load shedding programs will make it difficult to meet this requirement and cumulatively need to be defined.
Response: The SDT considers that the performance characteristic is achievable and a necessary requirement. Lack of coordination between generation control and under frequency load shedding program could result in inappropriate generator tripping and result in a failure of the overall program. The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.		
Midwest ISO	No – Delete the design parameter	V/Hz design parameters are appropriate for generation protection. We don't believe that is should be considered here as design parameter.
Response: It is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.		
Southern Company Services, Inc	No – Delete the design parameter	A volts per hertz requirement is more appropriate in a generator protection standard.
Response: It is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.		
PJM	No – Delete the design parameter	Add the units after the numbers mentioned (p.u. V/Hz). **Response:** The SDT believes that it is correct as stated. When discussing cumulatively, when is the accumulation timer reset: after a minute, an hour, a year? **Response:** The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics

Organization	Question 5	Question 5 Suggested Revisions:
		are achieved by the UFLS program design.
Florida Reliability Coordinating Council	No – Revise the design parameter as noted in the comments	Replace the words "Bulk Electric System" with "generator terminal". The volts per hertz limits contained in 4.4 correspond to recommendations typical for generators. The temporary overvoltages (TOV) that will follow islanding with UFLS action tend to be significantly higher on the EHV transmission system since generators will be absorbing Vars and pulling voltage down. The EHV TOV capabilities are generally much higher than generator V/Hz limits and may be more variable due to individual grid design practices regarding basic insulation level and lightning arrester ratings. **Response:** The buses for which this should apply should be determined according to volts per Hz limits on applicable equipment, etc. In addition, SDT clarifies that the requirement does not address overvoltage limits. The SDT modified Characteristic 4.4 (Requirement R6.4) to further specify the location (Requirements R6.4.1 and R6.4.2). Remove of the word “cumulatively”. (See comments for Question No. 3.)The context of the phrase “identified island” requires clarification. (See comments for Question No. 2.) **Response:** The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design.
SERC	No – Delete the design parameter	This requirement is very difficult to measure. A volts per hertz requirement is more appropriate in a generator protection standard.
Response: It is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.		
We Energies	No – Revise the design parameter as noted in the comments	This design parameter should be revised to clearly indicate that the base value of the per unit frequency component of the Volts per Hz ratio is 60 Hz to avoid any confusion with the scheduled frequencies that are used for time error correction (e.g. 59.98 or 60.02 Hz). **Response:** The design of the UFLS program, as demonstrated by simulation, must comply with the performance characteristics, not its performance during an event. We expect that all design simulations will be performed at a base frequency of 60 Hz. In addition, since the values listed in this design parameter are commonly used for generator volts per hertz protection settings, perhaps the system limits should have slightly lower allowable times so the generators do not

Organization	Question 5	Question 5 Suggested Revisions:
		trip undesirably during this period. **Response:** The technical basis for the performance characteristics was developed through a review of relevant industry standards that include voltage and frequency limits for major electrical equipment. The performance characteristics were selected to prevent equipment damage and to coordinate with generating unit protection. The SDT modified Characteristic 4.4 (Requirement R6.4) to further specify the location (Requirements R6.4.1 and R6.4.2).
Florida Power & Light Co.	No – Revise the design parameter as noted in the comments	Replace the words Bulk Electric System voltage with generator terminal voltage. The volts per hertz limits contained in 4.4 correspond to recommendations typical for generators. The temporary overvoltages (TOV) that will follow islanding with UFLS action tend to be significantly higher on the EHV transmission system since generators will be absorbing Vars and pulling voltage down. The EHV TOV capabilities are generally much higher than generator V/Hz limits and may be more variable due to individual grid design practices regarding basic insulation level and lightning arrester ratings. **Response:** We agree that the buses for which this should apply should be determined according to volts per Hz limits on applicable equipment, etc. In addition, SDT clarifies that the requirement does not address overvoltage limits. The SDT modified Characteristic 4.4 (Requirement R6.4) to further specify the location (Requirements R6.4.1 and R6.4.2). The words at least 25% should be replaced with up to 25% for the reasons discussed above. **Response:** The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island.
Progress Energy Carolinas, Inc.	No – Delete the design parameter	This requirement is very difficult to measure from a transmission system perspective. A volts per hertz requirement is more appropriate in a generator protection standard.
Response: It is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.		
Ameren	No – Delete the design parameter	We believe that a volts per hertz requirement is more appropriate in a standard that deals with generation protection issues.
Response: It is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to		

Organization	Question 5	Question 5 Suggested Revisions:
prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.		
Alliant Energy	No – Delete the design parameter	This a subjective performance criteria as modeling details such as load damping assumptions, inertia assumptions, and governor response assumption will all have considerable effect on performance. This type of performance objective is best evaluated and determined at the Regional level or some mechanism needs to be in place to allow aggressive load shedding programs some latitude on this. There are cases where overshoots above 61 Hz could be accepted for short periods. The type of units in the island also have to be considered. Hydro systems have fewer off-nominal frequency restrictions. **Response:** The UFLS program must be designed such that all interconnected systems will meet common performance characteristics. Common performance characteristics facilitate coordination between regions. The SDT believes that performance characteristics are achievable for imbalances up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. The 30 second time limit for operating above 60.5 Hz is not at all appropriate. Units can operate continuously at 60.5 Hz with no accelerated loss of life. They can run slightly above this for a long time. Could this be a typo? Was the intention to establish at 30 minute limit? **Response:** Based on industry comment the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that are developing generator requirements (PRC-024).
E.ON U.S.	No – Revise the design parameter as noted in the comments	See Response to Question 9.
Response: Please see our response to your comment to Question 9.		
Manitoba Hydro	No – Revise the design parameter as noted in the comments	Again, Manitoba Hydro echo's the MRO's concerns. Each region should determine the volts per Hz based on its system topology, how it was planned and designed and the region's requirements.
Response: The UFLS program must be designed such that all interconnected systems will meet common performance characteristics. Common performance		

Organization	Question 5	Question 5 Suggested Revisions:
characteristics facilitate coordination between regions. The SDT believes that performance characteristics are achievable for imbalances up to and including 25%. For an imbalance up to and including 25% these performance characteristics must be met; however, for an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
PacifiCorp	No – Revise the design parameter as noted in the comments	No issues related to the 1.18 V/Hz proposed requirement. The existing PacifiCorp standard overexcitation trip characteristic follows an inverse time characteristic for values over 1.08 V/Hz. The curve is set to protect a thermal unit per the manufacturer's recommendation. A typical curve will initiate a unit trip if the overexcitation value is 1.10 V/Hz for 291 seconds (4 min 51 seconds) a time delay that is more conservative than the manufacturer's recommendation. Overexcitation values are not typically accumulated. Protective relays implemented to protect the thermal fleet at PacifiCorp to not accumulate Volts/Hertz values. If the overexcitation element starts timing, then drops out, and once again starts timing the initial overexcitation event does not lower the trip time for the second event. ?????
Response: It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping. The SDT acknowledges that the PacifiCorp V/Hz protection application is more conservative than the proposed performance characteristic (Requirement R6.4).		
Transmission Reliability Program	No – Revise the design parameter as noted in the comments	Both question #5 above and the third bullet on page 3 of the summary document (starting with Bulk Electric System voltage . . . .) appear to be inconsistent regarding the "time durations" in the standard's characteristics section 4.4. Section 4.4 states: Control Bulk Electric System voltage during and following UFLS operations such that the per unit Volts per Hz (V/Hz) does not exceed 1.18 for longer than "two seconds" cumulatively, and does not exceed 1.10 for longer than "45 seconds" cumulatively. The language in question #5 above respectively references 6 seconds cumulatively and 1 minute cumulatively. Based on the discussion on page 3, the shorter timeframes shown in section 4.4 are the correct values.
Response: Performance characteristic 4.4 states: Control voltage during and following UFLS operations such that the per unit Volts per Hz (V/Hz) does not exceed 1.18 for longer than two seconds cumulatively, and does not exceed 1.10 for longer than 45 seconds cumulatively. The comment form does not reflect the characteristic but should have. This was an oversight.		
CenterPoint Energy	No – Delete the design parameter	As stated previously, CenterPoint Energy believes this effort should be postponed. Alternatively, this proposed design parameter should be deleted until coordination with the PRC-024 drafting team can be firmly established. If the design parameter is not deleted, CenterPoint Energy believes the proposed values are adequate to place proper balance and emphasis on system reliability as system performance can vary widely depending upon system load and the composition of assumed on-line generation under various conditions.
Response: While the Project 2007-09 – Generator Verification (PRC-024) standard drafting team is addressing generator tripping requirements for off-nominal frequency and voltage, they are not explicitly addressing V/Hz protection. This performance characteristic (Requirement R6.4) is based on applicable IEEE		

Organization	Question 5	Question 5 Suggested Revisions:
standards and need not be delayed or deleted to allow coordination with the Generator Verification SDT.		
FirstEnergy Corp.	No – Delete the design parameter	1. When using the term "cumulatively" in this characteristic, when is the accumulation timer reset: a minute, an hour, a year? We are not clear if this is based on a design parameter or an "after-the-fact" performance review. We ask the SDT to provide clarification on this term. **Response:** The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design. 2. We recommend that this design parameter be deleted. The intent appears to be an attempt to prevent the overexcitation of generators and, to a lesser degree, transformers. It would be very difficult for entities responsible for setting UFLS equipment to conceive of every imbalance condition and prevent the possibility of any localized generator overexcitation to occur. These design parameters would be more appropriately addressed in generation protection standards to assure that generating units that can have impact on the frequency of the bulk electric system utilize proper overexcitation protection. **Response:** It is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.
American Transmission Company	No – Revise the design parameter as noted in the comments	With respect to the 25 percentage (Characteristic 4), refer to comments for Question 2. **Response:** See response to question 2. With respect to the 6-second or 1-minute V/Hz values (Characteristic 4.4), the basis for these values has not been well established. In addition, for some potential islands the appropriate volt/hertz limits might vary based on the composition of generators and transformers in the island. Absolute continent-wide values may not be appropriate. The Characteristics could require that the proper voltage/hertz limits be investigated and established for each potential island. The proper V/Hz limits should be re-examined and changed, if necessary, whenever a generator or transformer is added or removed for a potential island and may potentially change the limits. **Response:** The technical basis for the performance characteristics was developed through a review of relevant industry standards that include voltage and frequency limits for major electrical equipment. The performance characteristics were selected to prevent equipment damage and to coordinate with generating unit protection. The

Organization	Question 5	Question 5 Suggested Revisions:
		SDT included more details regarding the technical justification for the performance characteristics in the comment form background (including specific IEEE standards). The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. The SDT considers that continent-wide limits are appropriate and that the performance characteristic is achievable and a necessary requirement. Systems also need to perform acceptably for the benefit of the interconnection during events involving larger portions of an interconnection.
Indiana Municipal Power Agency	No – Revise the design parameter as noted in the comments	The term cumulatively is confusing. It either needs to be clarified or removed. A clarification is needed on the per unit Volts per Hz relay protection. Is this relay protecting a generator step up transformer or a transmission/distribution transformer? If it covers the generator step-up transformer, then this item should not be covered in NERC PRC-024 standard and not in a regional standard.
Response: The SDT clarifies that cumulative is per event simulated to verify that the performance characteristics are achieved by the UFLS program design. It is not the purpose of this standard to set generator volts per Hz requirements, but to ensure that the UFLS program operation does not result in generator volts per Hz tripping. The SDT modified Characteristic 4.4 (Requirement R6.4) to further specify the location (Requirements R6.4.1 and R6.4.2).		
Duke Energy	No – Delete the design parameter	Delete or at least revise this characteristic. Volts per hertz is not typically monitored or limited on the power system itself. It is more of a concern with regard to equipment protection. This would be a difficult requirement to measure with the current modeling software (and modeling tools). If voltage following an event is the concern, then a requirement for voltage (only) should be stated. The limits in item 4 above should be sufficient to define performance for frequency. It is not clear why a voltage requirement is required since the transmission system must be operated within stated voltage limits regardless. Again, if voltage or issues like tripping capacitors are a concern, it should be stated differently.
Response: It is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.		
Georgia Transmission Corporation	No – Delete the design parameter	This requirement would be better served in the generator protection standard.
Response: It is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to		

Organization	Question 5	Question 5 Suggested Revisions:
prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.		
Entergy	No – Delete the design parameter	We agree with and support the SERC comments.
Response: It is appropriate to include these performance characteristics in this project because over-voltages that are a direct result of UFLS operations must be considered when UFLS programs are designed and implemented. If design verification studies show an overvoltage problem, corrective measures must be applied to prevent equipment damage and further unnecessary outages or disturbances. It is not the purpose of this standard to set generator volts per Hz requirements but to ensure that the UFLS program operation does not result in generator volts per Hz tripping.		
PPL Generation	Yes	UFLS scheme should adhere to the IEEE standards for machines.
NPCC	Yes	
Buckeye Power, Inc.	Yes	
Northeast Utilities	Yes	
Independent Electricity System Operator	Yes	

6. If there are any other characteristics in the UFLS Regional Reliability Standard Characteristics document that you disagree with, please identify them here, and either identify that they should be deleted, or recommend an alternative.

Summary Consideration:

The Underfrequency Load Shedding drafting team reviewed responses to this question and based on these comments made several conforming and/or clarifying changes to the performance characteristics (now Requirements).

- Several comments raised concerns that the "UFLS Regional Reliability Standard Characteristics" did not assign responsibility for specific requirements, instead leaving this to the regional standard development process. The SDT believes these concerns are addressed by the SDT deciding to convert the "UFLS Regional Reliability Standard Characteristics" into a continent-wide standard, which required the SDT to assign responsibility for each requirement.

- Several comments suggested that the database should be updated annually for consistency with the annual certification of the amount of load expected to be shed, and to ensure up-to-date data is available for analysis of system events. Other comments questioned whether the certification of amount of load expected to be shed is a measure of compliance rather than a requirement. The SDT agreed with these comments and revised the performance characteristic (Requirement R8) to require annual updates of the database. The SDT also removed the annual certification noting this obligation is effectively addressed by Requirements R9 (annual database updates) and R10 (provide load tripping in accordance with the UFLS program design). The measures by which compliance with these Requirements will be assessed will be defined in the Measures section of the proposed standard.

- Several comments expressed concern with the requirement to identify potential islands, noting this may be difficult if not impossible in tightly integrated systems, that other means than system studies or actual system operations should be permitted and that additional specificity should be provided as to the criteria for identification of islands. The SDT acknowledges the potential difficulty in interconnected systems, but noted that it is important that potential islands studied are based on physical characteristics of the system. The SDT clarified requirements concerning identification of islands in Requirements R3, R4, and R5, including provisions to include "any other islands necessary to ensure that all portions of the region's Bulk Electric System are included in at least one island." The SDT declined to prescribe a methodology for identifying islands, noting that unique physical characteristics of regions across the continent resist attempts to define common criteria.

- One comment indicated that the term "cumulative" should be removed from the overexcitation limits. The SDT believes the cumulative reference in performance characteristic 4.4 (Requirement R6.4) is appropriate. If during an islanding event the excitation on a transformer or generator exceeded 1.18 pu for an extended period of time, it would be inappropriate to reset the time requirement following a brief decline below 1.18 pu. The SDT has revised performance characteristic 4 to clarify the intent that these cumulative limits apply for each simulated event; not cumulatively for all actual system events.

Several responses to this question reiterate concerns regarding coordination with the PRC-024 drafting team expressed in prior questions. The SDT clarifies that it coordinated with the PRC-024 Generator Verification Standard Drafting Team by providing the generator tripping curves to ensure that the performance characteristics do not conflict with the generator tripping curves.

Several responses to this question reiterate concerns regarding the 25% imbalance (at system peak) expressed in prior questions. The SDT clarifies that the 25% represents the imbalance between load and generation not the amount of load at system peak to be shed. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island.

- Some responses to this question reiterate concerns expressed in prior questions that it is more appropriate for the Planning Coordinators associated with the individual regions/islands to determine appropriate design values, while still coordinating with other regions/islands. These responses indicated that most if not all of the UFLS characteristics can be performed under the auspices of the Planning Coordinator function. The SDT clarifies that the performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. We agree the UFLS design parameters can be devised by the Planning Coordinators and have assigned the Planning Coordinators this responsibility in the proposed standard.

Organization	Question 6	Question 6 Suggested Revisions:
NPCC	Disagree with one or more of the characteristics as noted in the comments	We believe that characteristic 8 in the "UFLS Regional Reliability Standard Characteristics" should require database updates on an annual basis consistent with the requirement for annual certification of the amount of load expected to be shed in characteristic 11. Up-to-date data is a necessary requirement for analysis of system events.
Response: The SDT has revised characteristic 8 (Requirement R9) to require entities to provide data annually in order to ensure that up-to-date data is available when required for post-event analysis of system disturbances. The SDT did not include characteristic 11 in the proposed standard. The proposed standard is no longer asking the responsible entity to annually certify the amount of load it expects to shed during a system event. The SDT believes that the obligation is covered by Requirement R9 and Requirement R10. This is intended to eliminate the confusion regarding characteristic 11.		
Grand River Dam Authority	Disagree with one or more of the characteristics as noted in the comments	In part 5 and 6 there is reference to PRC-024. I could not find this. Should it be mentioned now or should it wait until it is available?
Response: The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the references to PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 (Requirement R6) will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
ERCOT	Disagree with one or more of the characteristics as noted in the comments	Regarding characteristic item 6, we believe it should only apply for Generator(s) that a Region have exempted from being compliant with PRC-024 and hence are aware of the impact on the UFLS effectiveness. The current wording suggests that the UFLS should compensate for any Generator(s) whenever they are non-compliant with PRC-024. Suggested wording be changed to: Item 6. If the Region has exempted any generators from the underfrequency tripping requirements of PRC-024, the Standard shall specify how such generators shall avoid

Organization	Question 6	Question 6 Suggested Revisions:
		jeopardizing UFLS effectiveness, or how entities responsible for designing UFLS shall compensate for any such non-compliant generators in their area to avoid jeopardizing UFLS effectiveness. The Standard shall require modeling of these method(s) in the UFLS assessment specified in item 10 below to ensure UFLS effectiveness is not jeopardized.
Response: The intent of characteristic 6 is to prevent generators from jeopardizing performance of the UFLS programs during underfrequency events. This can only be accomplished if all generators, regardless of whether they are exempted from or non-compliant with PRC-024, are correctly modeled and accounted during the design of UFLS programs. The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
American Electric Power (AEP)	Disagree with one or more of the characteristics as noted in the comments	
Response: The SDT requires more information on your concern to be responsive to your concern.		
PPL Generation	Disagree with one or more of the characteristics as noted in the comments	Comments on Items 2 and 3: Determination of "potential islands" may be difficult, if not impossible, to determine for tightly integrated electrical systems. **Response:** The SDT agrees that identification of potential islands required in characteristic 2 may be difficult in tightly interconnected systems. However, it is important that the potential islands studied are based on physical characteristics of the system which can be identified through analysis of actual system events or through system studies, such as analyses used to identify coherent groups of generation. The SDT has clarified requirements concerning identification of islands in Requirements R3, R4 and R5. Comments on Item 4: As noted earlier, the characteristics proposed should be used as a guideline with provisions for deviation from the guidelines if mis-coordination existing between the UFLS program and legacy generating facilities. **Response:** The SDT does not agree that the characteristics should be guidelines. Any miscoordination between the UFLS program and legacy generating facilities can be addressed through modifications to the UFLS programs such as percent load drop or frequency threshold settings. The SDT has limited the performance requirements to addressing those aspects of the design and implementation that have a direct impact on reliability. Common performance requirements such as those provided in performance characteristic 4 (Requirement R6) are necessary to achieve coordination of UFLS programs.

Organization	Question 6	Question 6 Suggested Revisions:
		Comments on Items 5 and 6: Because PRC-024 is not available for review; it is not clear how these characteristics are related to the standard and how the generator or the entity responsible for the UFLS program is to comply. **Response:** The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The combined performance requirement characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz, and at or below 61.8 Hz. Comments on Item 9: PPL Corporation suggests identifying a responsible entity very early in the standard drafting process. Failure to do so can make the standard approval process more difficult. Further, identifying the responsible entities early can help in ensuring a better product in the end. **Response:** The SDT agrees with the comment on characteristic 9. The SDT has assigned the Transmission Owner and Distribution Provider this responsibility in the proposed standard (Requirement R10). Comments on Item 10: PPL Corporation suggests that the Regional Entity be identified as the responsible party. This would be consistent with the SDT's recommendation that the Regional Entity author the standard. If the Regional Entity delegates the responsibility, a separate agreement should be developed to accomplish this rather than rather than including the agreement in the standard. **Response:** The SDT believes it is not necessary to assign responsibility for characteristic 10 to the Regional Entity in order to ensure system reliability. The SDT recognizes that NERC standards should not be applicable to Regional Entities and has assigned the Planning Coordinators within a region this responsibility in the proposed standard (Requirement R7). Comments on Item 11: The text of this characteristic is confusing. PPL Corporation suggests clarifying wording of the characteristic and clearly identify what is it be certified annually, i.e. amount (MW) of load to be shed if that is what the SDT intended. **Response:** The SDT did not include characteristic 11 in the proposed standard. The proposed standard is no longer asking the responsible entity to annually certify the amount of load it expects to shed during a system event. The SDT believes that the obligation is covered by Requirement R9 and Requirement R10. This is

Organization	Question 6	Question 6 Suggested Revisions:
		intended to eliminate the confusion regarding characteristic 11.
Southwest Power Pool	Disagree with one or more of the characteristics as noted in the comments	If PRC-024 hasn't been developed as an enforceable standard, how do we know that we can comply with Characteristics 5 and 6?
Response: The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
Bandera Electric Cooperative	Disagree with one or more of the characteristics as noted in the comments	The TRE UFLS SDT believes that the requirement that frequency shall not remain below 59.5 Hz for greater than 30 seconds would require a change in the existing ERCOT UFLS program Step 1 (59.3 Hz). The halfway-point between 60 Hz (normal) and 58.5 Hz (10 second minimum) is 59.25 Hz. **Response:** Based on industry comments the SDT has revised the performance characteristics (Requirement R6.2) from 59.5Hz to 59.3 Hz for 30 seconds while still maintaining coordination with typical turbine operating characteristics. Frequency overshoot can be planned for by providing numerous steps of UFLS to avoid the overshoot. This should be fine for a gradual decay of frequency. However, during a large drop in frequency, all steps will operate simultaneously causing a possible overshoot. What can be done to reduce frequency at this point? **Response:** The SDT assumes that this condition would occur for a generation deficiency greater than 25%. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. For an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. The SDT does not believe that the scenario mentioned by the commenter would lead to a frequency overshoot because the simultaneous operation of all steps would only occur if the imbalance exceeded the program capability. BEC voltage during and following UFLS operations shall be controlled not to exceed 1.18 for longer than 6 seconds cumulatively and 1.10 for longer than 1 minute cumulatively. Who should be responsible for non-compliance? Can this standard be enforced? **Response:** The SDT intended that performance characteristic 4 would apply only to the design of the UFLS

Organization	Question 6	Question 6 Suggested Revisions:
		program; not to post-event analysis of actual system events. As such the entity responsible for the design of the UFLS program will be responsible for demonstrating compliance with this performance characteristic under simulated conditions. The SDT believes this performance characteristic is enforceable as a UFLS program design requirement. The SDT has revised the language in characteristic 4 (Requirement R6) to better reflect our intent.
Midwest ISO	Disagree with one or more of the characteristics as noted in the comments	Item 5 references standard PRC-024. This standard should be vetted with these characteristics. Item 6 should not use the term non-compliant. A standard and its associated requirements are expected to be complied with. We suggest replacing item 6 with "The standard shall require taking into account the effect of generator underfrequency trip set points."
Response: The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
Southern Company Services, Inc	Disagree with one or more of the characteristics as noted in the comments	Requirement 6 of the characteristics states the following: "The Standard shall specify how generators that are non-compliant with the PRC-024 underfrequency tripping requirement shall avoid jeopardizing UFLS effectiveness, or how entities responsible for designing UFLS shall compensate for any non-compliant generators in their area to avoid jeopardizing UFLS effectiveness. The Standard shall require modeling of these method(s) in the UFLS assessment specified in item 10 below to ensure UFLS effectiveness is not jeopardized." Is this requirement too open-ended for the responsible entity to have to "compensate" for non-compliant generators or does this approach give the responsible entity adequate flexibility to design mitigation plans into its methodologies? This seems to imply that (1) the non-compliant generators have already been identified and (2) that the responsible entity (not the non-compliant generator) shall be held responsible if mitigation plans are insufficient. We feel that Requirement 6 needs to avoid the use of the term "non-compliant" and instead focus on modeling actual generator trip points. We propose replacing Requirement 6 with the following: "The standard shall require taking into account the effect of generator underfrequency trip set points." The requirement, as originally written, is more appropriate in a generator protection standard. Non-compliance with PRC-024 should be addressed within PRC-024. Requirement 5 should be deleted since it is redundant with Requirement 4. Requirement 4.1, 4.2 and 4.3 should be re-worded to establish coordination with PRC-024 in each of the areas shown. As written, we feel there is a possibility of creating a double jeopardy situation with what may be written into the requirements of PRC-024.
Response: The SDT agrees. The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet		

Organization	Question 6	Question 6 Suggested Revisions:
characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
PJM	Disagree with one or more of the characteristics as noted in the comments	Delete Items 8 and 9 - should be handled in the Functional Model.
Response: The NERC Functional Model defines the reliability functions required for maintaining electric system reliability so that organizations involved in ensuring reliability can identify those functions they perform, and register with NERC as one or more of the Responsible Entities. The Functional Model is not intended to contain the level of specificity necessary to identify what entities are responsible for specific requirements of reliability standards. The SDT believes it is appropriate for standards to identify the entities responsible for providing data for database maintenance (characteristic 8, now Requirement R9) and owning, installing, and setting UFLS equipment (characteristic 9, now Requirement R10). The SDT has assigned the Transmission Owner and Distribution Provider these responsibilities in the proposed standard.		
Florida Reliability Coordinating Council	Disagree with one or more of the characteristics as noted in the comments	The characteristics should specify design criteria of the UFLS Programs and should not be confused with the actual system performance following an underfrequency condition. The UFLS Program should be developed to meet the design characteristics with the understanding that system performance will be dependent on the current system conditions and could potentially not meet the design characteristics of the program. Bullet No. 4 of the characteristics should read, "The Standard shall require that the UFLS Program be developed incorporating the following design characteristics?"
Response: The SDT intended that characteristic 4 (Requirement R6) would apply only to the design of the UFLS program; not to post-event analysis of actual system events. The SDT has revised the language in the proposed standard to better reflect our intent.		
Southern Company Services, Inc. – Trans	Disagree with one or more of the characteristics as noted in the comments	In addition to the above comments, requirement #6 need to avoid use of the term "non compliant" and instead focus on modeling actual generator trip points. Propose replacing # 6 with the following: "The standard shall require taking into account the effect of generator underfrequency trip set points." Requirement 5 should be deleted since it is redundant with Requirement 4.
Response: The SDT agrees. The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		

Organization	Question 6	Question 6 Suggested Revisions:
Northeast Utilities	Disagree with one or more of the characteristics as noted in the comments	Section 10.2 of the draft characteristics requires an assessment be conducted every 5 years. Based on experience, the schedule for a given analysis can drag beyond a deadline when there is difficulty in achieving convergence of study results, or modeling problems. There should be some accommodation in the Standard to account for these schedule overruns.
Response: The SDT recognizes the complexity involved with UFLS design. Developing the process for complying with performance characteristic 10.2 (Requirement R7) is left to the Planning Coordinators in each region. Re-assessment of the design, to be done at least every 5 years thereafter the original design, will be accomplished with the advantage of foreknowledge of the complexity and time involved in the initial UFLS program design. The Planning Coordinators must take this into account when developing their process for scheduling the UFLS design re-assessment.		
We Energies	Disagree with one or more of the characteristics as noted in the comments	Please see comments associated with question 5.
Response: Please see responses to comments associated with question 5.		
Florida Power & Light Co.	Disagree with one or more of the characteristics as noted in the comments	The design of a coordinated underfrequency load shedding program is primarily a planning activity that is based on analysis of potential islanding scenarios. With the exceptions noted above, it is reasonable to expect that a UFLS program's technical design parameters will meet the electrical design requirements identified in item four of the UFLS Regional Reliability Standard Characteristics for a load mismatch of 25%. Meeting these frequency and voltage design limits becomes increasingly difficult with higher load mismatch scenarios. The UFLS Regional Reliability Standard Characteristics as currently drafted implies the performance requirements should be applicable to both planned contingency scenarios and to actual performance during frequency excursions. The Regional Entity UFLS standards should require a simulation study of planned grid conditions that demonstrates that a potential island with a load mismatch of at least 25% will meet the frequency and voltage performance requirements. Applying these requirements to actual disturbance events is inappropriate because of the large number of possible scenarios that may lead to frequency excursions. **Response:** The SDT agrees with the comment that meeting the proposed performance characteristics would become increasingly difficult for generation imbalances exceeding 25 percent. The SDT intended that compliance would not be required for an imbalance greater than 25% and has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/(load) of up to 25 percent within the identified island. For an imbalance exceeding 25% the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.

Organization	Question 6	Question 6 Suggested Revisions:
		It is possible that an actual system islanding event occurs through a complex combination of multiple outages and adverse operating conditions that are impossible to predict. The Regional Entity UFLS standards should require a simulation study of planned grid conditions that demonstrates that a potential island with a load mismatch of 25% will meet the frequency and voltage performance requirements. Accordingly, the words or actual system conditions should be removed from item 2 in the UFLS Regional Reliability Standard Characteristics. **Response:** The SDT intended that performance characteristic 2 would apply only to design of the UFLS program; not to post-event analysis of actual system events. However, it is important that the potential islands studied are based on physical characteristics of the system which can be identified through analysis of actual system events or through system studies, such as analyses used to identify coherent groups of generation. The SDT has clarified requirements concerning identification of islands in Requirements R3, R4 and R5. Item 5 in the UFLS Regional Reliability Standard Characteristics as currently worded would prevent the use of additional layers of backup UFLS protection. The FRCC requires 9 UFLS steps be armed with a total of 56% of planned peak load. Some of these steps provide time delayed backup levels of protection in case frequency stabilizes at a level below 59.7 hertz or in case unplanned generator trips occur. In the event an island formed with a 50% load mismatch, it is likely frequency would go below 57.0 hertz and that generator tripping would occur before these time delayed backup steps would have a chance to operate. The words by requiring that UFLS programs complete execution before generators begin to trip on underfrequency should be removed from item 5 in the UFLS Regional Reliability Standard Characteristics. **Response:** As stated above, Regional Entities may, if they choose, develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedures for an imbalance exceeding 25%. The SDT has decided to revise and combine characteristics 5 and 6. In doing so, the words “by requiring that UFLS programs complete execution before generators begin to trip on underfrequency” have been removed from the combined characteristic (Requirement R7).
Exelon	Disagree with one or more of the characteristics as noted in the comments	Requirement 9 should specify the criteria used to determine an island subject to this standard. **Response:** Performance characteristic 2 (Requirement R5) does not provide criteria for determining potential islands; however, provides guidance that potential islands studied are based on physical characteristics of the system which can be identified through historical events or system studies, such as analysis used to identify coherent groups of generation, limited number of transmission connections, limited transfer capability, etc. Regions across the continent have unique physical characteristics that resist attempts to define common criteria to determine islands.

Organization	Question 6	Question 6 Suggested Revisions:
		Requirements 1 and 2 should specify which entities are responsible for determining what load is responsible for meeting the UFLS performance requirements of R4. Requirement 3 should specify which entities will ensure coordination across intra and inter-Regional boundaries. This should be consistent across the continent. **Response:** The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and has assigned responsibility for these requirements within the proposed standard. Requirement 5 and 6 should not address specific Standards, as it is unclear how this document could be updated if particular Standards were added, revised, or deleted which affect the Requirements included here. Requirement 6 is confusing - is non-compliance with portions of PRC-024 allowed through mechanisms alluded to here? **Response:** The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz. Requirements 7, 8, 9 and 10 should specify which entities are to maintain a data base, which entities are to maintain the data base and determine required parameters, which entities are responsible for owning, installing, and setting UFLS equipment, and which entities are responsible for performing UFLS assessments, respectively. **Response:** The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and has assigned responsibility for these requirements within the proposed standard.
Progress Energy Carolinas, Inc.	Disagree with one or more of the characteristics as noted in the comments	In addition to the above comments, NERC Characteristic #6 needs to avoid use of the term "non compliant" and instead focus on modeling actual generator trip points. Propose replacing Characteristic # 6 with the following: "The standard shall require taking into account the effect of generator underfrequency trip set points." Characteristic #5 should be deleted since implementation of Characteristic #4 should achieve this objective (i.e. Characteristic #5 is redundant).
Response: The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations		

Organization	Question 6	Question 6 Suggested Revisions:
performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
Ameren	Disagree with one or more of the characteristics as noted in the comments	Regarding Item #7, we believe that the Regional Entity should maintain the database to provide uniformity and consistency. Regarding Item #9, the Standard which specifies who owns, install, or sets UFLS equipment should accommodate existing practices. For example, in some organizations, DP actually sheds the load to remedy a GO/TO system-wide event and the standard should ensure that these practices will be allowed to continue. Regarding Item #10, the regional entity should be responsible for performing the assessment or having an assessment performed.
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and has assigned responsibility for characteristic 7 (Requirement R8) and characteristic 10 (Requirement R7) to the Planning Coordinators within each Region. The SDT recognizes that NERC standards should not be applicable to Regional Entities. The SDT agrees that existing practices should be accommodated where possible. The Planning Coordinators may define the UFLS program in a manner that accommodates existing practices with respect to shedding load. Regarding characteristic 9 (Requirement R10), Transmission Owners and Distribution Providers have been assigned responsibility in the continent-wide standard.		
Alliant Energy	Disagree with one or more of the characteristics as noted in the comments	The system performance (Requirement 4) prescribed by the SDT is based on typical values and their engineering judgment, and do not reflect how individual systems (or islands) were planned and designed (and what were/are deemed as acceptable risks). We believe it more appropriate for the Planning Coordinators associated with the individual regions/islands to decide what are the appropriate design values (for 4.1 to 4.4), while still coordinating with other regions/islands. We also believe most if not all of the UFLS characteristics can be performed under the auspices of the Planning Coordinator function. **Response:** The performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. We agree the UFLS design parameters can be devised by the Planning Coordinators and have assigned the Planning Coordinators this responsibility in the proposed standard. The MRO would ask that characteristics 5 and 6 remove the reference to PRC-024, but do agree with the need for coordination between UFLS and generation protection and expressing the characteristics 5 and 6 in more general terms. **Response:** The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below

Organization	Question 6	Question 6 Suggested Revisions:
		61.8 Hz.
E.ON U.S.	Disagree with one or more of the characteristics as noted in the comments	See Response to Question 9.
Response: Please see our response to your comment to Question 9.		
Manitoba Hydro	Disagree with one or more of the characteristics as noted in the comments	#8 requires entities to provide data at least every 5 years to support the UFLS database. #11 requires responsible entities to certify annually that the load it expects to shed will result in frequency excursions below the initializing set points of the regional UFLS standard. How can the responsible entity certify this, when the database, and therefore modeled conditions, may be 4 years out of date? Entities should be required to provide data annually to the UFLS, even if it is a "no change" ascertained.
Response: The SDT has revised characteristic 8 (Requirement R9) to require entities to provide data annually in order to ensure that up-to-date data is available when required for post-event analysis of system disturbances. The SDT did not include characteristic 11 in the proposed standard. The proposed standard is no longer asking the responsible entity to annually certify the amount of load it expects to shed during a system event. The SDT believes that the obligation is covered by Requirement R9 and Requirement R10. This is intended to eliminate the confusion regarding characteristic 11.		
PacifiCorp	Disagree with one or more of the characteristics as noted in the comments	Remove the requirement that the over excitation element be cumulative.
Response: The SDT believes the cumulative reference in performance characteristic 4.4 (Requirement R6.4) is appropriate. If during an islanding event the excitation on a transformer or generator exceeded 1.18 pu for an extended period of time, it would be inappropriate to reset the time requirement following a brief decline below 1.18 pu. The SDT has revised performance characteristic 4 to clarify the intent that these cumulative limits apply for each simulated event; not cumulatively for all actual system events.		
CenterPoint Energy	Disagree with one or more of the characteristics as noted in the comments	Characteristic Item 11 proposes that a UFLS regional standard include a requirement that owners of UFLS equipment must certify, on an annual basis, the amount of load it expects to shed in an underfrequency event. CenterPoint Energy concurs that some type of annual mechanism is warranted to "measure" whether the required load will be shed within a particular region, as UFLS is a critical safety net for the Bulk Power System - providing a last resort function. However, it would be expected that a UFLS regional standard would include the percentages of load to be shed as a Requirement. Therefore, CenterPoint Energy recommends that Characteristic Item 11 be deleted as a Requirement. CenterPoint Energy believes that a Requirement is not the appropriate vehicle to prescribe the type of compliance mechanism (e.g. certification, surveys, assessments), nor

Organization	Question 6	Question 6 Suggested Revisions:
		the frequency (e.g., annually) of the compliance check. These types of compliance items should be determined through the regional standard development process.
Response: The SDT did not include characteristic 11 in the proposed standard. The proposed standard is no longer asking the responsible entity to annually certify the amount of load it expects to shed during a system event. The SDT believes that the obligation is covered by Requirement R9 and Requirement R10. The SDT has revised characteristic 9 (Requirement R10) to specify that "Each Transmission Owner and Distribution Provider shall provide load tripping in accordance with the UFLS program designed by the group of Planning Coordinators for each region in which they operate." The measure by which compliance with the Requirement will be assessed will be defined in the Measures section of the proposed standard.		
FirstEnergy Corp.	Disagree with one or more of the characteristics as noted in the comments	Characteristics #5 and #6 - It is difficult to determine the acceptability of these characteristics since industry has not yet seen a draft of PRC-024 (Generator Performance During Frequency and Voltage Excursions). Completion of the development of these characteristics and coordination of these characteristics with the proposed requirements of PRC-024 cannot be finalized until the PRC-024 has been fully vetted through industry and approved by NERC and FERC.
Response: The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
American Transmission Company	Disagree with one or more of the characteristics as noted in the comments	The references to the PRC-024 standard should be removed and the desired characteristic restated in more general terms.
Response: The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
Indiana Municipal Power Agency	Disagree with one or more of the characteristics as noted in the comments	A characteristic needs to be added to allow exemptions for equipment that might not be able to meet these under frequency characteristics or the Volts per Hz settings. Some equipment relay protection may not be able to be changed due to OEM limitations which need to be properly protected to prevent equipment damage. If an entity can provide the technical documentation to back up this OEM limitation and notifies the transmission planner, then an exemption should be allowed and not force an entity to be non-compliant.
Response: The proposed performance characteristics do not create any requirements that prohibit proper protection of equipment. The SDT does agree that		

Organization	Question 6	Question 6 Suggested Revisions:
equipment limitations should be addressed in any PRC standard that establishes protective relay setting requirements.		
Duke Energy	Disagree with one or more of the characteristics as noted in the comments	Disagreements are noted in the responses above. Additionally, -- Recommend deleting Requirement 5 since it is redundant with Requirement 4.-- Requirement 6 should avoid use of the term "non compliant". Compliance, and consequently non-compliance, should be handled in PRC-024 itself. If the goal is to verify the UFLS scheme while considering generation trip setpoints, then this requirement should focus on modeling the generation trip setpoints. Propose replacing Requirement 6 with the following: "The standard shall require generator underfrequency tripping be included in the UFLS assessment specified in item 10 below."-- **Response:** The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz. Requirement 2 states that "The Standard shall require that these islands be identified either through system studies or actual system operations, and may also include other islands as deemed appropriate by the specified entity(s) as a design basis for UFLS." The wording should be changed so that islands can be identified as appropriate and not just by system studies or actual system operations. For systems that have not experienced islanding events and where system studies have not shown islands, this would be difficult to meet. Recommend changing the requirement to read, "The Standard shall require that these islands be identified either through system studies, actual system operations, or other islands as deemed appropriate by the specified entity(s) as a design basis for UFLS." **Response:** Performance characteristic 2 (Requirement R5) has been revised so that islands may include “those islands selected by applying the criteria in Requirement 3, if any” (which considers historical events and system studies) and “any other islands necessary to ensure that all portions of the region’s Bulk Electric System are included in at least one island.”
Georgia Transmission Corporation	Disagree with one or more of the characteristics as noted in the comments	Requirement #6 needs to avoid the use of the term "non compliant" and instead focus on modeling actual generator trip points
Response: The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate		

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with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
Entergy	Disagree with one or more of the characteristics as noted in the comments	We agree with and support the SERC comments.
Response: The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
Southwest Power Pool	Disagree with one or more of the characteristics as noted in the comments	Since PRC-024 is not a currently enforceable standard, we can not concur with Characteristics 5 and 6.
Response: The SDT has decided to revise and combine characteristics 5 and 6. In doing so, we have eliminated the reference to generators that are non-compliant with PRC-024. The SDT is coordinating with the Generator Verification SDT (Project 2007-09) to ensure that UFLS programs that meet characteristic 4 will coordinate with PRC-024, therefore eliminating the need for a direct reference to PRC-024. The combined characteristic (Requirement R7) now requires that dynamic simulations performed by each group of Planning Coordinators include modeling the trip settings of any generators that trip at or above 58.0 Hz and at or below 61.8 Hz.		
Transmission Reliability Program	Agree with all proposed characteristics	
Independent Electricity System Operator	Agree with all proposed characteristics	
Buckeye Power, Inc.	Agree with all proposed characteristics	
Louisiana Generqting, LLC	Agree with all proposed characteristics	
City Water, Light	Agree with all proposed	

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& Power - Springfield, IL	characteristics	

7. The SDT proposes that the regional standards include the database requirements contained in existing Reliability Standard PRC-007. Do you agree that database requirements should be addressed within the Regional Standards?

Summary Consideration:

The responses to this question support the requirement for regional databases. The SDT has retained the regional aspect of the database requirement within the proposed continent-wide standard by assigning responsibility to the group of Planning Coordinators in each region to create and maintain a database containing relay information needed for assessments and event analysis (Requirement R8).

Several comments suggested that a common format for the database be established. The SDT believes that a variety of formats could serve reliability equally well and as such the SDT does not feel compelled to specify a format in the proposed continent-wide standard. The group of Planning Coordinators in each region has been assigned the responsibility for assessments of the UFLS program in the proposed continent-wide standard and is therefore best suited to identify the program database format.

Some comments suggested that the database should be updated annually, reiterating concerns expressed in responses to prior questions. The SDT agreed with these comments and revised the performance characteristic (Requirement R8) to require annual updates of the database.

One comment suggested including requirements for archiving the regional UFLS data. The SDT will address archiving requirements in the Data Retention section of the proposed standard.

Organization	Question 7	Question 7 Suggested Revisions:
Exelon	No	It would be helpful for inter-Regional coordination studies to have a common set of database requirements. Why not specify them here to ensure that this is standardized?
Response: The SDT expects that each regional UFLS database will need to contain the UFLS data items needed for UFLS assessments. While the approach proposed in the first posting would have allowed the regions to assign this responsibility, the SDT in the proposed standard has assigned the specification of database content to the Planning Coordinators in each region.		
E.ON U.S.	No	E.ON U.S. believes that database requirements should be established on a case-by-case basis. A database that tracks the dynamically changing system conditions under normal operation is not necessary. Only instances when an UF event occurs should be subject to a data retention requirement
Response: The SDT would like to clarify that the database contains UFLS program data; not event data.		
PPL Generation	Yes and No	PPL agrees that the database requirements should be addressed within the Regional Standard developed. However, the data requirements must be clearly identified. Further, the burden of providing such data in particular data formats (for study

Organization	Question 7	Question 7 Suggested Revisions:
		purposes) should not be delegated to the UFLS program owner - the Regional Entity performing the study should be responsible for data preparation and formatting.
Response: The SDT expects that each regional UFLS database will need to contain the UFLS data items needed for UFLS assessments. While the approach proposed in the first posting would have allowed the regions to assign this responsibility, the SDT in the proposed standard has assigned the specification of database content to the Planning Coordinators in each region. Any decisions on formatting requirements for data submittals by UFLS program owners are likewise reserved to the Planning Coordinators.		
Alliant Energy	Yes and No	The MRO agrees that any database requirements should be addressed within the Regional Standards. However, we hope that the database requirements among regions within the same Interconnection are the same. In addition, we would expect that the database would be required to be updated every year.
Response: The SDT expects that each regional UFLS database will need to contain the UFLS data items needed for UFLS assessments. While the approach proposed in the first posting would have allowed the regions to assign this responsibility, the SDT in the proposed standard has assigned the specification of database content to the Planning Coordinators in each region. A requirement for annual update of the regional UFLS databases has been added to the continent-wide standard (see Requirement R8).		
Bandera Electric Cooperative	Yes	The TRE UFLS SDT believes each regional UFLS program should include the requirement for archiving the region's UFLS data and that database should be available to entities within the region and should be part of the region's requirements constituting auditable compliance with the standard. The TRE UFLS SDT feels these databases are required to efficiently conduct the necessary studies. The regional standard should also clearly define the entity responsible/accountable for complying with the standard (equipment ownership, equipment maintenance, database maintenance, reporting, etc.) perhaps the RC or PA. Regardless of who is designated, that functional entity should be responsible for developing a database format/template to ensure UFLS data consistency and completeness as well as study efficiency.
Response: Under the continent-wide standard now being proposed, Planning Coordinators would be responsible for creating and maintaining a regional UFLS database. Archiving requirements will be covered in the Data Retention section of the proposed standard. The remaining points in this comment are consistent with the concept of regional standards in support of a continent-wide standard which the proposed continent-wide standard would allow.		
Southern Company Services, Inc	Yes	PRC-007 contains the specific requirement for ?documentation [to be provided for the] Regional Reliability Organization to maintain and update a UFLS program database.? PRC-006 specifies the design details to be addressed, such as frequency set points, time delays, etc. Some latitude is given to the regions in formulating the details of their UFLS programs and individual regional programs may differ to some extent. Therefore, in order to demonstrate that these region specific requirements are being meet, the database requirements will need to be included in the regional standards. Also, PRC-006 requires periodic dynamic simulations to assess the effectiveness of the UFLS program (ref. PRC-006 R1.4.2). Since different regions may have different requirements, the ability to obtain the necessary information to perform the required

Organization	Question 7	Question 7 Suggested Revisions:
		dynamic simulations (either on a regional basis or by individual entities), depends on being able to obtain the type of data that would reside in a UFLS program database. Including the database requirements within the Regional Standards will help ensure this is possible.
Response: Thank you for your support.		
SERC	Yes	PRC-007 contains the specific requirement for "documentation [to be provided for the] Regional Reliability Organization to maintain and update a UFLS program database." PRC-006 specifies the design details to be addressed, such as frequency setpoints, time delays, etc. Some latitude is given to the regions in formulating the details of their UFLS programs and individual regional programs may differ to some extent. Therefore, in order to demonstrate that these region specific requirements are being meet, the database requirements will need to be included in the regional standards. Also, PRC-006 requires periodic dynamic simulations to assess the effectiveness of the UFLS program (ref. PRC-006 R1.4.2). Since different regions may have different requirements, the ability to obtain the necessary information to perform the required dynamic simulations (either on a regional basis or by individual entities), depends on being able to obtain the type of data that would reside in a UFLS program database. Including the database requirements within the Regional Standards will help ensure this is possible.
Response: Thank you for your support.		
Buckeye Power, Inc.	Yes	Regional databases should have a common format and the database should have transparent coordination
Response: The SDT expects that each regional UFLS database will need to contain the UFLS data items needed for UFLS assessments. While the approach proposed in the first posting would have allowed the regions to assign this responsibility, the SDT in the proposed standard has assigned the specification of database content to the Planning Coordinators in each region. Any decisions on formatting requirements for data submittals by UFLS program owners are likewise reserved to the Planning Coordinators.		
Progress Energy Carolinas, Inc.	Yes	PRC-007 contains the specific requirement for "documentation [to be provided for the] Regional Reliability Organization to maintain and update a UFLS program database." PRC-006 specifies the design details to be addressed, such as frequency setpoints, time delays, etc. Some latitude is given to the regions in formulating the details of their UFLS programs and individual regional programs may differ to some extent. Therefore, in order to demonstrate that these region specific requirements are being meet, the database requirements will need to be included in the regional standards. Also, PRC-006 requires periodic dynamic simulations to assess the effectiveness of the UFLS program (ref. PRC-006 R1.4.2). Since different regions may have different requirements, the ability to obtain the necessary information to perform the required dynamic simulations (either on a regional basis or by individual entities), depends on being able to obtain the type of data that would reside in a UFLS program database. Including the database requirements within the Regional Standards will help

Organization	Question 7	Question 7 Suggested Revisions:
		ensure this is possible.
Response: Thank you for your support.		
American Transmission Company	Yes and No	ATC agrees that any database requirements should be addressed within the Regional Standards. However, we hope that the database requirements among regions within the same Interconnection are the same. In addition, we would expect that the database would be required to be updated every year.
Response: The SDT expects that each regional UFLS database will need to contain the UFLS data items needed for UFLS assessments. While the approach proposed in the first posting would have allowed the regions to assign this responsibility, the SDT in the proposed standard has assigned the specification of database content to the Planning Coordinators in each region. A requirement for annual update of the regional UFLS databases has been added to the continent-wide standard (see Requirement R8).		
Entergy	Yes	We agree with and support the SERC comments.
Response: Thank you for your support.		

8. Are you aware of any conflicts between the proposed regional standards and any regulatory function, rule, order, tariff, rate schedule, legislative requirement, or agreement?

Summary Consideration:

The responses to this question did not identify any conflicts with regulatory functions, roles, orders, tariffs, rate schedules, legislative requirements, or agreements. Several comments suggested that state tariffs and OATT requirements need to be reviewed for potential conflicts, but no comments identified conflicts and it is not apparent to the SDT that any exist.

Some comments suggested potential confusion with existing programs or identifying responsibility for providing load shedding. The SDT believes these concerns are addressed in the continent-wide standard by assigning applicability to "Distribution Providers" and "Transmission Owners with end-use Load connected to their Facilities where such end use load is not part of a Distribution Provider's load." We believe this covers all load and eliminates potential confusion regarding Load Serving Entities.

One comment expressed concern with potential conflicts between PRC-006 and PRC-024 and recommended that development of PRC-006 be delayed until PRC-024 has been approved. The SDT believes that adequate coordination exists between the Generator Verification SDT developing PRC-024 and development of PRC-006. The SDT will continue to coordinate with the GVSDT and we believe it does not matter whether PRC-006 or PRC-024 is approved first as long as this coordination exists.

One comment expressed concern with potential conflicts with the draft Reliability First regional standard and legacy ECAR documents. The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.

Organization	Question 8	Question 8 Suggested Revisions:
Southern Company Services, Inc	Yes	We are concerned that the Under-Frequency Load Shedding characteristics are being developed and finalized prior to the development of the Generator Verification Standard - PRC-024. Since regional standards must coordinate with PRC-024 it is only prudent that the UFLS Drafting Team and the Regions have knowledge of the approved version of PRC-024 before the Drafting Team/Standards Committee requires regions to coordinate with the Generation Verification Standard. Also, some OATT requirements may need to be adjusted to be consistent with regional requirements.
Response: The technical basis for the UFLS performance characteristics was developed through a review of relevant industry standards that include voltage and frequency limits for major electrical equipment. The performance characteristics were selected to prevent equipment damage and to coordinate with generating unit protection. In addition, the SDT coordinated with the PRC-024 Generator Verification Standard Drafting Team (GV SDT) by providing the underfrequency performance curve to ensure that the performance characteristics do not conflict with the generator off nominal frequency capability curve. The GV SDT has posted the generator off nominal frequency capability curve for industry comment and the UFLSDT will continue to coordinate with the GV SDT on this item. The UFLSDT believes it does not		

Organization	Question 8	Question 8 Suggested Revisions:
matter whether PRC-006 or PRC-024 is approved first as long as this coordination exists. Thank you for your input and caution. Individual drafting team members are not aware of any conflicts and based on numerous comments there are not any apparent conflicts.		
FirstEnergy Corp.	Yes	We feel that the design parameters specified in characteristic #4 conflicts with the draft RFC standard and legacy ECAR document.
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard. Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure.		
Bandera Electric Cooperative	Yes and No	The TRE UFLS SDT believes there may potentially be a conflict. The ERCOT Power Region has customer choice of Retail Energy Providers (REP)/LSE. Although the standard appears to be written as permissible in not enforcing UFLS requirements on an LSE ("...and Load-Serving Entity that owns or operates a UFLS program (as required by its Regional Reliability Organization)...)", it might be construed that LSEs in ERCOT may be subject to the requirements under the standard as written. The TRE UFLS SDT also comments that the proposed standard does not address allocation to self-serve or large industrials. The TRE UFLS SDT believes that self-serve entities with load and generation connected to the grid should be addressed.
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and has assigned applicability to "Distribution Providers" and "Transmission Owners with end-use Load connected to their Facilities where such end use load is not part of a Distribution Provider's load." We believe this covers all load and eliminates potential confusion regarding Load Serving Entities.		
PacifiCorp	Yes and No	Proposed regional standard should specify the responsibility for dropping loads that are not served by operator of the control area, such as power generated in another control area and then scheduled to serve distribution loads of another utility.
Response: The SDT has decided to convert the "Characteristics of UFLS Regional Reliability Standards" into a continent-wide standard and has assigned applicability to "Distribution Providers" and "Transmission Owners with end-use Load connected to their Facilities where such end use load is not part of a Distribution Provider's load." We believe this covers all load.		
Entergy	No	We agree with and support the SERC comments.
Response: Thank you for your input and caution. Individual drafting team members are not aware of any conflicts and based on numerous comments there are not any apparent conflicts.		

Organization	Question 8	Question 8 Suggested Revisions:
American Electric Power (AEP)	No	All state tariffs need to be reviewed for conflicts.
Response: Thank you for your input and caution. Individual drafting team members are not aware of any conflicts and based on numerous comments there are not any apparent conflicts.		
SERC	No	Some OATT requirements may need to be adjusted to be consistent with regional requirements.
Response: Thank you for your input and caution. Individual drafting team members are not aware of any conflicts and based on numerous comments there are not any apparent conflicts.		
Progress Energy Carolinas, Inc.	No	Some OATT requirements may need to be adjusted to be consistent with regional requirements.
Response: Thank you for your input and caution. Individual drafting team members are not aware of any conflicts and based on numerous comments there are not any apparent conflicts.		
City Water, Light & Power - Springfield, IL	No	
NPCC	No	
Grand River Dam Authority	No	
ERCOT	No	
Florida Power & Light	No	
Southwest Power Pool	No	
Louisiana Generqting, LLC	No	
Midwest ISO	No	
PJM	No	

Organization	Question 8	Question 8 Suggested Revisions:
Florida Reliability Coordinating Council	No	
Buckeye Power, Inc.	No	
Northeast Utilities	No	
We Energies	No	
Exelon	No	
Ameren	No	
Alliant Energy	No	
E.ON U.S.	No	
Manitoba Hydro	No	
Transmission Reliability Program	No	
Independent Electricity System Operator	No	
CenterPoint Energy	No	
American Transmission Company	No	
Duke Energy	No	
Georgia Transmission Corporation	No	
Southwest Power Pool	No	

9. Do you have any other questions or concerns with the proposed Under Frequency Load Shedding Regional Reliability Standard Characteristics that have not been addressed? If yes, please explain.

Summary Consideration:

In general the responses to this question reiterate concerns expressed in responses to prior questions. A few new issues were raised in responses to this question.

- One comment suggested the need to manage automatic load restoration in concert with the UFLS program. The SDT agrees and has added a requirement (R7.3) in the proposed continent-wide standard to require modeling of automatic load restoration in the five year assessments performed by the group of Planning Coordinators in each region.
- Some comments expressed concern that requiring "dynamic simulations" to verify the UFLS program design was overly prescriptive and could be revised to "analytical studies." The SDT believes it is not possible to verify the adequacy of the implementation of the regional UFLS program in achieving the performance characteristics without some sort of dynamic simulation and has decided to retain this level of specificity.
- Some comments suggested the need for the standard to recognize coordination requirements with other frequency responsive load programs. The SDT believes the Planning Coordinators need to consider any such programs to ensure their implementation coordinates with the performance characteristics contained in the proposed continent-wide standard.

The remaining responses to this question reiterate concerns expressed in responses to prior questions.

- Several comments expressed concern with the requirement to identify potential islands, noting this may be difficult if not impossible in tightly integrated systems, that other means than system studies or actual system operations should be permitted, and that additional specificity should be provided as to the criteria for identification of islands. The SDT acknowledges the potential difficulty in interconnected systems, but noted that it is important that potential islands studied are based on physical characteristics of the system. The SDT clarified requirements concerning identification of islands in Requirements R3, R4, and R5, including provisions to include "any other islands necessary to ensure that all portions of the region's system are included in at least one island." The SDT declined to prescribe a methodology for identifying islands, noting that unique physical characteristics of regions across the continent resist attempts to define common criteria.
- Several responses to this question reiterate concerns regarding the 25% imbalance (at system peak) expressed in prior questions. The SDT clarifies that the 25% represents the imbalance between load and generation not the amount of load at system peak to be shed. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island.
- Several responses to this question reiterate concerns regarding coordination with the PRC-024 standard drafting team expressed in prior questions. The SDT clarifies that it coordinated with the PRC-024 Generator Verification Standard Drafting Team by providing the generator tripping curves to ensure that the performance characteristics do not conflict with the generator tripping curves.
- Several comments raised concerns that the "UFLS Regional Reliability Standard Characteristics" did not assign responsibility for specific requirements, instead leaving this to the regional standard development process. The SDT believes these concerns are addressed by the

SDT deciding to convert the "UFLS Regional Reliability Standard Characteristics" into a continent-wide standard, which required the SDT to assign responsibility for each requirement.

- Several comments suggested that the database should be updated annually for consistency with the annual certification of the amount of load expected to be shed, and to ensure up-to-date data is available for analysis of system events. The SDT agreed with this comment and revised the performance characteristic (Requirement R8) to require annual updates of the database.
- Several comments suggested the need to clarify that compliance with the performance characteristics is demonstrated through design of the UFLS program rather than analysis of actual system events. The SDT agrees and has modified Requirement R6 in the proposed continent-wide standard to clarify this point.
- Some responses to this question indicate that it is more appropriate for the Planning Coordinators associated with the individual regions/islands to determine appropriate design values, while still coordinating with other regions/islands. These responses indicated that most if not all of the UFLS characteristics can be performed under the auspices of the Planning Coordinator function. The SDT clarifies that the performance characteristics are intended to ensure coordination among the programs the Planning Coordinators are required to design. We agree the UFLS design parameters can be devised by the Planning Coordinators and have assigned the Planning Coordinators this responsibility in the proposed standard.

Organization	Question 9	Question 9 Suggested Revisions:
NPCC	Yes	We believe that the phrase "meet the following performance characteristics for underfrequency conditions resulting from an imbalance between load and generation of at least 25 percent" could be interpreted to require meeting the performance requirements for all generation deficiencies between 25 percent and 100 percent, instead of the intended 0 percent to 25 percent. We recommend that this phrase be revised as "meet the following performance characteristics for underfrequency conditions resulting from all imbalances between load and generation between 0 and 25 percent." We understand the intent of using the words "at least" may have been to recognize that regions may base their program on deficiencies greater than 25 percent; however, it is not necessary to provide within these characteristics that regions may exceed these requirements. The related NERC "Implementation Plan for Underfrequency Load Shedding Regional Reliability Standard Characteristics" must consider that some regional programs may require modification in order to meet these requirements. Accordingly, a time based implementation schedule should be developed with input from the Regional Drafting Teams once more detail surrounding the individual Regional Standards are known.
Response: The SDT agrees and has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. The SDT agrees that there is a need for a time based implementation schedule. A future draft of the continent-wide standard will have an implementation plan that will consider modifications in order to meet these requirements.		

Organization	Question 9	Question 9 Suggested Revisions:
Florida Power & Light	Yes	This proposed standard references PRC -024 which is not yet an approved standard has not been released for comment, and does not seem to be available on the NERC website for review.
Response: The SDT has decided to revise and combine characteristics 5 and 6 (now covered by Requirement R7). In doing so, we have eliminated the references to PRC-024.		
PPL Generation	Yes	PPL agrees with the concept proposed by the SDT. However, unique problems can exist for generators not owned/operated by the host regulated TO/TSP. Such entities cannot make arrangements with "load" to mitigate a generator UF trip setting that may fall above the lowest setting of load UF trip settings. Generator manufacturers UF/OF trip points are extremely important and may be the independent variable in this equation. Generator owners/operators must respect the manufacturer's recommendations for the generator UF trip settings. Generator Owner/Operator shall provide the lowest plant underfrequency setting and basis for this setting to the TO/TSP and or BA/RC in order to ensure coordination with the load UF trip settings. It should also be understood that the lowest manufacturer setting of the generator may not be the driving UF setting that needs to be coordinated with the TO/TSP UFLS scheme of the transmission system. For example, a nuclear unit may have a reactor pump UF setting or the Reactor protective system both having UF relays that can result in a trip of the unit. In any event, the host TO/TOP/TSP/BA needs to coordinate the UFLS program settings with the generators most limiting UF trip settings. The Regional Entity, with input from TO/TSP and generators, should be responsible for ensuring such coordination exists.
Response: The SDT is coordinating with Project 2007-09: Generator Verification (PRC-024) and will continue to do so as the projects develop. The SDT is proposing requiring the group of Planning Coordinators in each region to model the trip settings of generators that would trip at or above 58.0 Hz and at or below 61.8 Hz in Requirement R7. The Planning Coordinators would still need to show that their UFLS program design satisfies the performance characteristics in Requirement R6. Generator Owners have been removed from the applicability section of the proposed standard.		
Southwest Power Pool	Yes	Please include parameters that will address each region's approach conducting studies as requested in UFLS regional reliability standard characteristic. **Response:** The SDT needs more information regarding your concern to provide a response. > Is it acceptable for each region to assume that it is an island separate from neighboring region(s) when performing these studies even though during an actual event each region in Eastern Interconnect is interconnected to neighboring regions? **Response:** It is important that the potential islands studied are based on physical characteristics of the system which can be identified through analysis of actual system events or through system studies, such as analysis used to identify coherent groups of generation. The SDT has clarified requirements concerning identification of islands in Requirements R3, R4 and R5.

Organization	Question 9	Question 9 Suggested Revisions:
		> There is a lot of wording in the questions in the Comment Form that states thing like: "must act", "does not exceed", "must arrest" This type of wording makes very rigid requirements and leaves little room for unplanned situations, mis-operations or acts of God. The wording needs to be modified to include the word "designed"; i.e. the system must be "designed" to act, must be "designed" to not exceed, and must be "designed" to arrest. This seems to apply we are making our best effort to meet the requirement, but not be penalized (found out-of-compliance) for something beyond our control. **Response:** This is the SDT's intent. The design of the UFLS program, as demonstrated by simulation, must comply with the performance characteristics, not its performance during an event. The standard has been modified to further clarify this point (Requirement R6). > The frequency setting of first stage load shedding should be the same across the Eastern Interconnected system. **Response**: The SDT does not share this view. Existing UFLS programs in the Eastern Interconnection have various initial thresholds. As long as the performance characteristics are achieved, differences in first stage frequency trip points between regions are acceptable from a reliability standpoint. > The frequency set points mentioned in the document such as 58.0, 59.5, 61.0, etc. have been established decades ago by compiling the result of survey from different manufacturers in the IEEE publication. If a common set of frequency setpoints to be adopted for system wide usage, then, it is prudent that these settings be revisited. **Response:** These values have been selected to coordinate with the turbine capability of manufacturers reflected in PRC-024 generator off-nominal frequency performance requirements. The SDT is coordinating with Project 2007-09: Generator Verification (PRC-024) and will continue to do so as the projects develop.
Bandera Electric Cooperative	Yes	The TRE UFLS SDT believes the NERC standard should recognize the coordination requirements within and between the region's automatic UFLS and other frequency-related load shed programs. **Response:** The SDT disagrees that the proposed standard should recognize the coordination requirements within and between the region's automatic UFLS and other frequency related load shed programs. The Planning Coordinators will need to consider any such programs to ensure that implementation of these programs coordinate with the performance characteristics contained in the proposed continent-wide standard. The continent-wide performance criteria should require the regional standard clearly state the authority (i.e., RE, TP, TO, DSP, LSE, etc) that is responsible for the various requirements specified in the standard. **Response:** The SDT agrees and the applicability is now being identified in the proposed continent-wide standard.

Organization	Question 9	Question 9 Suggested Revisions:
		The TRE UFLS SDT also questions if the NERC performance criteria should set the values for frequency decline (etc) in the NERC characteristics? Could these be a required characteristic but set by the Region with proof of methodology? **Response:** The proposed UFLS program performance characteristics are reasonable means to set a coordinated level of performance for regional UFLS programs without restricting flexibility to specify UFLS program design parameters that best accommodate regional needs. The performance characteristics also ensure coordination with generator under-frequency trip points being developed for PRC-024 in Project 2007-09, Generator Verification. Also, what supporting documentation for restricting frequency overshoot to 61.0 Hz? We request that that NERC Generation Verification SDT state its reasoning/explanation. **Response:** Based on industry comment, the SDT revised this characteristic (Requirement R6.3) from 61 Hz to 61.8Hz for any duration. In addition, the SDT revised the characteristic (Requirement R6.3) from 60.5 Hz to 60.7 Hz for 30 seconds. These changes are intended to coordinate with generator limitations and are being coordinated with the Generator Verification SDT that is developing generator requirements (PRC-024). The TRE UFLS SDT also expresses its concern regarding compliance issues. For example, how will compliance be addressed for an entity which meets the region's UFLS program's design standards, yet the program does not yield the results expected under actual conditions? How will compliance be determined? **Response:** The design of the UFLS program, as demonstrated by simulation, must comply with the performance characteristics, not its performance during an event. The standard has been modified to further clarify this point (Requirement R6).
Orrville Utilities	Yes	This standard should only apply to entities that have the capability of monitoring regional load imbalance. Many distribution providers (DPs) and load serving entities (LSEs) such as municipal utilities and REAs have no knowledge of their regional load status. If these DPs and LSEs are required to own and maintain any type of automated load shedding system, it will be triggered on the basis of frequency. This could possibly cause them to shed load under localized frequency excursions caused by severe weather, which is not required by this standard as written. If load imbalance will remain an integral part of this standard, then entities that do not have the capability to track regional load should be exempt from it. **Response:** The monitoring of real-time load imbalance is neither required nor applicable. The percent generation-load imbalance specified in item 4 (now Requirement R6) is intended to be used in simulation and serve as the basis for coming up with technical design parameters consisting of frequency trip points, step sizes, time delays, etc. All regional under-frequency load shedding (UFLS) programs must be triggered on frequency. Localized frequency excursions can occur only if a local area becomes disconnected (islanded) from the interconnection. If an island does occur and frequency falls below the trip points, the proposed

Organization	Question 9	Question 9 Suggested Revisions:
		standard requires that load shall be shed in accordance with the UFLS program's technical design parameters. An additional provision of this standard should be to allow DPs and LSEs that draw less than 100 megawatts (perhaps a larger number may be appropriate) from the BES to isolate themselves from the BES before a frequency excursion reaches 59.0 Hz, and/or before the duration of the excursion has reached 30 seconds. Some DPs and LSEs generate a portion of their load, and allowing them to isolate themselves early may enable them to maintain electric service to hospitals, municipal water systems, police and fire departments in the event that the BES cannot be saved from blackout. **Response:** Uncoordinated isolation of DPs or LSEs must be avoided. The Planning Coordinators will need to ensure that isolation of DPs or LSEs coordinate with the performance characteristics contained in the proposed continent-wide standard.
Midwest ISO	Yes	Item 10.1 should not require dynamic simulation but rather analytical studies.
Response: SDT believes it is not possible to demonstrate that the adequacy of the implementation of the regional UFLS program in achieving the performance characteristics can be verified without some sort of dynamic simulation.		
Southern Company Services, Inc	Yes	Requirement 2 states that "The Standard shall require that these islands be identified either through system studies or actual system operations, and may also include other islands as deemed appropriate by the specified entity(s) as a design basis for UFLS." The wording needs to be changed because it requires that islands shall be identified through system studies or actual system operations. Some systems may not have experienced any islanding events and system studies may not show any potential events. The wording should be changed so that "other islands deemed appropriate" can be used as the only islands, not just as additional islands. The sentence should read "The Standard shall require that these islands be identified either through system studies, actual system operations, or other islands as deemed appropriate by the specified entity(s) as a design basis for UFLS." **Response:** The SDT agrees that the wording in the proposed standard needs to be clarified. It is important that islands used for UFLS assessments are based on physical characteristics of the system which can be identified through analysis of actual system events or through system studies, such as analysis used to identify coherent groups of generation. The SDT has clarified requirements concerning identification of islands in Requirements R3, R4 and R5. Other areas: 1) Requirement 6 (if not replaced as proposed in our response to Question 6) - "The Standard shall specify how generators that are non-compliant with the PRC-024 underfrequency tripping requirement shall avoid jeopardizing UFLS effectiveness, or how [[insert "the entity(s)"]] [[strike "entities"]] responsible for designing UFLS shall compensate?" **Response:** The SDT has decided to revise and combine characteristics 5 and 6 (now covered by Requirement R7). In doing so,

Organization	Question 9	Question 9 Suggested Revisions:
		we have eliminated the references to PRC-024. 2) At Requirements 10.2, 10.3 and 11 and observation was made that the use of "responsible entity" and "entity(s) responsible" seems inconsistent across the three characteristics. If the terminology is consistent, perhaps the drafting team would consider placing Item 11 immediately after Item 9. Both characteristics address "owning, installing, and setting UFLS equipment". **Response:** The applicability is now being identified in the proposed continent-wide standard. 3) Requirement 11 - "The Standard shall require that the entity(s) responsible for owning, installing, and setting UFLS equipment, in accordance with item 9 above, shall annually certify [[strike "that"]] the amount of load it expects to shed during a system event which results in system frequency excursions below the initializing set points of the regional UFLS standard." **Response:** The SDT did not include characteristic 11 in the proposed standard. The proposed standard is no longer asking the responsible entity to annually certify the amount of load it expects to shed during a system event. The SDT believes that the obligation is covered by Requirement R9 and Requirement R10. The SDT has revised characteristic 9 (Requirement R10) to specify that "Each Transmission Owner and Distribution Provider shall provide load tripping in accordance with the UFLS program designed by the group of Planning Coordinators for each region in which they operate.
Florida Reliability Coordinating Council	Yes	The design of a coordinated underfrequency load shedding program is primarily a planning activity that is based on analysis of potential islanding scenarios. With the exceptions noted above, it is reasonable to expect that a UFLS program's technical design parameters will meet the electrical design requirements identified in item four of the UFLS Regional Reliability Standard Characteristics, for a load mismatch of 25%. Meeting these frequency and voltage design limits becomes increasingly difficult with higher load mismatch scenarios. The UFLS Regional Reliability Standard Characteristics as currently drafted implies the performance requirements should be applicable to both planned contingency scenarios and to actual performance during frequency excursions. The Regional Entity UFLS standards should require a simulation study of planned grid conditions that demonstrates that a potential island with a load mismatch of at least 25% will meet the frequency and voltage performance requirements. Applying these requirements to actual disturbance events is inappropriate because of the large number of possible scenarios that may lead to frequency excursions. It is possible that an actual system islanding event occurs through a complex combination of multiple outages and adverse operating conditions that are impossible to predict. The Regional Entity UFLS standards should require a simulation study of planned grid conditions that demonstrates that a potential island with a load mismatch of at least 25% will meet the frequency and voltage performance requirements. Accordingly, the words "or actual system operations" should be removed from item 2 in the UFLS Regional Reliability Standard Characteristics. **Response:** The comment reflects the SDT's intent. The SDT has modified the performance characteristic (now Requirement R6) to clarify an imbalance = (load — actual generation output)/ (load) of up to 25 percent within the identified island. Compliance with performance characteristics when the imbalance is

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		greater than 25 % is not required by this standard. The design of the UFLS program, as demonstrated by simulation, must comply with the performance characteristics, not its performance during an event. The standard has been modified to further clarify this point (Requirement R6). Item 5 in the UFLS Regional Reliability Standard Characteristics as currently worded would prevent the use of additional layers of backup UFLS protection. The FRCC requires 9 UFLS steps be armed with a total of 56% of planned peak load. Some of these steps provide backup levels of protection in case unplanned generator trips occur. The words by requiring that UFLS programs complete execution before generators begin to trip on underfrequency should be removed from item 5 in the UFLS Regional Reliability Standard Characteristics. **Response:** The SDT believes that proposed performance characteristic values are achievable for generator deficits up to and including 25%. For an imbalance up to and including 25%, these performance characteristics must be met; however, for an imbalance exceeding 25%, the Regional Entities may develop other performance requirements through Regional Standards or Regional Variances as outlined in the NERC Rules of Procedure. The requirement for UFLS programs to complete execution before generators begin to trip has been removed. However, the Planning Coordinators would still need to show that their UFLS program design satisfies the performance characteristics in Requirement R6. The characteristics, as written, do not allow for a Regional Entity to set the design parameters of a UFLS Program. Since the FRCC has a single UFLS Program, to meet these characteristics the FRCC would be required to write a Regional Standard that would require compliance by the FRCC. The characteristics should be modified to state that these design parameters are required in a Regional Standard, if the Region has UFLS Programs designed by others. They should also state that a Regional Entity may have a UFLS Program and the program should be designed to meet these design parameters. **Response:** While the approach proposed in the first posting would have allowed the regional standard to assign the responsibility for setting the design parameters, the proposed continent-wide standard requires the Planning Coordinators within a region to define the amount of load shed required, how many blocks, at what frequency, etc.
SERC	Yes	Requirement 2 states that "The Standard shall require that these islands be identified either through system studies or actual system operations, and may also include other islands as deemed appropriate by the specified entity(s) as a design basis for UFLS." The wording needs to be changed because it requires that islands shall be identified through system studies or actual system operations. Some systems may not have experienced any islanding events and system studies may not show any potential events. The wording should be changed so that "other islands deemed appropriate" can be used as the only islands, not just as additional islands. The sentence should read "The Standard shall require that these islands be identified either through system studies, actual system operations, or other islands as deemed appropriate by the specified entity(s) as a design basis for UFLS."

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Response: The SDT agrees that the wording in the proposed standard needs to be clarified. It is important that islands used for UFLS assessments are based on physical characteristics of the system which can be identified through analysis of actual system events or through system studies, such as analysis used to identify coherent groups of generation. The SDT has clarified requirements concerning identification of islands in Requirements R3, R4 and R5.		
Buckeye Power, Inc.	Yes	It is very important for Major Objective 1 from project 2007-01 to be achieved. If the standard increases costs significantly without providing a demonstrated reliability improvement it will be burdensome for some entities to bear without adding reliability value. A study should be performed to analyze the existing system requirements and to analyze where flexibility can increase or decrease value in the UFLS regional systems as part of the characteristics of the UFLS standard. The study can be used to aid in drafting the regional standard from a quantitative or technical perspective allowing for database coordination.
Response: The SDT's intent is to avoid imposing substantial costs with little or no incremental reliability benefit. The proposed continent-wide standard is intended to leverage existing practices while ensuring that these programs meet a continent wide level of reliability. Flexibility in choosing UFLS design parameters is maximized by specifying performance characteristics rather than continent-wide design parameters. There is a range of design parameters that regions may choose within that will allow UFLS programs to achieve the performance characteristics. A study by the Planning Coordinators within each region will be necessary to verify that the UFLS programs' technical design parameters achieve the performance characteristics.		
Northeast Utilities	Yes	Consider whether the document should ensure that responsible parties manage their automatic reclosing programs, along with the UFLS program.
Response: The SDT added a requirement to the proposed standard (Requirement R7.3) to include the modeling of automatic load restoration in the five year assessment.		
Progress Energy Carolinas, Inc.	Yes	Characteristic #2 states that "The Standard shall require that these islands be identified either through system studies or actual system operations, and may also include other islands as deemed appropriate by the specified entity(s) as a design basis for UFLS." The wording needs to be changed because it requires that islands shall be identified through system studies or actual system operations. Some systems may not have experienced any islanding events and system studies may not show any potential events. The wording should be changed so that "other islands deemed appropriate" can be used as the only islands, not just as additional islands. The sentence should read "The Standard shall require that these islands be identified either through system studies, actual system operations, or other islands as deemed appropriate by the specified entity(s) as a design basis for UFLS."
Response: The SDT agrees that the wording in the proposed standard needs to be clarified. It is important that islands used for UFLS assessments are based on physical characteristics of the system which can be identified through analysis of actual system events or through system studies, such as analysis used to identify coherent groups of generation. The SDT has clarified requirements concerning identification of islands in Requirements R3, R4 and R5.		
Alliant Energy	Yes	In general we believe it should be left to the Regions to determine what the UFLS limits should be.

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		As noted in this questionnaire, the SDT found that there are many ways to perform the UFLS function, depending on the characteristics of the Region. We believe that NERC should insure that there is a UFLS program in place in each region, that there is adequate technical justification for each region's UFLS program, the program is reviewed annually and the necessary changes made, etc. The Regions should be responsible to perform the necessary studies, determine the UFLS setpoints, undershoot/overshoot targets, etc. and enforce them. We believe that will deliver the most flexible and efficient method to implement UFLS. **Response:** Specifying performance characteristics is a reasonable means to set a minimum level of performance for regional UFLS programs without restricting flexibility to specify UFLS program design parameters that best accommodate regional needs. They establish common performance requirements to facilitate coordination between regions in an interconnection. They also ensure coordination with generator under-frequency trip points also being developed for PRC-024 in Project 2007-09, Generator Verification. Requirement 10.1: Change "through dynamic simulations" to "through analytical studies" because verification of meeting some performance requirements can be performed with other types of methods and simulations. **Response:** SDT believes it is not possible to demonstrate that the adequacy of the implementation of the regional UFLS program in achieving the performance characteristics can be verified without some sort of dynamic simulation. There needs to be an awareness that overvoltages will affect the performance of UFLS load shedding due to the increases in system load. One approach is to trip capacitors along with load (or take comparable actions) to try to keep voltages reasonable. Switchable high voltage line shunts and reactors also need to be considered where appropriate. Obviously, the goal would be to keep voltages close to initial levels as load is shed yet we recognize that despite best efforts, we will get considerable fluctuation in voltage as load is shed. **Response:** The SDT agrees on the need for this awareness and thanks the commenter.
E.ON U.S.	Yes	The design parameter is dynamic in nature. The Distribution provider at E.ON U.S. installs and maintains the UFLS hardware. E.ON U.S. can not ascertain at this time how the standard will impact the extent and location of individual relays. E.ON U.S. believes that its current installation is adequate to meet this design standard but if NERC believes that they do not, the financial impact of meeting NERC's requirements could be significant. E.ON U.S. questions whether the expense required to meet the standard, as proposed, is justified given the small likelihood that an UF event will occur. **Response:** Specifying performance characteristics is a reasonable means to set a minimum level of performance for regional UFLS programs without restricting flexibility to specify UFLS program design parameters that best accommodate regional needs. They

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		establish common performance requirements to facilitate coordination between regions in an interconnection. Existing UFLS programs that meet these performance requirements will not require modification. The SDT agrees that underfrequency events are unlikely, but such events can adversely impact the Bulk Electric System if properly coordinated UFLS programs are not in place. Additionally, the standard is unclear as to how often the process must be updated (annually or other) E.ON U.S. requests that the standard be changed to require updates only when system conditions change to an extent that the existing UFLS processes must be altered. This would protect against doing unneeded updates for standardized time periods but would not eliminate that requirement if system conditions warrant changes in the UFLS processes. Making updates only when necessary as opposed to an administratively determined time frame will reduce costs which will benefit customers **Response:** Characteristic 10 (now Requirement R7) indicates that the Planning Coordinators in each region shall conduct a UFLS assessment every five years. Modifications to the UFLS program are required only when the assessment demonstrates that the performance requirements are not met; however, equipment settings and installations must conform to the program requirements.
Manitoba Hydro	Yes	Rather than trying to set a uniform performance criteria, the SDT should develop the characteristic and requirements that must be included in the regional and/or sub regional UFLS programs and let the regions and subregions to specify the performance criteria to meet the requirements. A key component is to coordinate UFLS with the generator protection for various conditions within the region. Therefore, it should be the responsibility of the regions and/or subregions to design their UFLS for their respective areas.
Response: Specifying performance characteristics is a reasonable means to set a minimum level of performance for regional UFLS programs without restricting flexibility to specify UFLS program design parameters that best accommodate regional needs. They establish common performance requirements to facilitate coordination between regions in an interconnection. They also ensure coordination with generator under-frequency trip points also being developed for PRC-024 in Project 2007-09, Generator Verification.		
PacifiCorp	Yes	UFLS Regional Reliability Standard Characteristics should be coordinated and modified if the Generator Verification Standard Drafting Team changes design parameters associated with generating unit protection as well as the generator tripping for both over and under frequency levels.
Response: The SDT is coordinating with Project 2007-09: Generator Verification (PRC-024) and will continue to do so as the projects develop.		
CenterPoint Energy	Yes	This draft contains numerous references to islands, presupposing regional and/or predetermined islanding, which may not be applicable for all interconnections, especially a single region interconnection.
Response: It is important that islands used for UFLS assessments are based on physical characteristics of the system which can be identified through analysis of actual system events or through system studies, such as analysis used to identify coherent groups of generation. The SDT has clarified requirements concerning		

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identification of islands in Requirements R3, R4 and R5.		
FirstEnergy Corp.	Yes	FE has the following additional comments: 1. We believe that the characteristics should include shedding of load in minimum amount of steps as appropriate for the region. For example, for some regions it is necessary to shed load in a minimum of three steps to prevent overspeed tripping. **Response:** Historically, regions have taken different approaches in establishing detailed design parameters (including amount of load shedding steps) for the region's UFLS program and the proposed standard permits these different approaches to continue provided they meet the performance characteristics. 2. With regard to characteristic #9, it would be difficult for a standard to specify the entity that owns or physically installs UFLS equipment. We suggest this be re-worded as follows: "The standard shall specify the entity(s) responsible for implementing a UFLS program." **Response:** The applicability is now being identified in the proposed continent-wide standard. 3. The minimum UFLS characteristics should require coordination between regional entities to assure a wide-area view (i.e. the entire interconnection or wide view based on engineering studies) **Response:** The SDT believes that Requirement R4 address this concern. 4. Characteristic #11 requires the regional standard include requirements for the entity to "…annually certify the amount of load it plans to shed" We question why the requirement states this since this is more of an audit function; i.e. wouldn't the compliance monitor "certify" this? This characteristic should be removed and believe that the other characteristics cover this. **Response**: The SDT did not include characteristic 11 in the proposed standard. The proposed standard is no longer asking the responsible entity to annually certify the amount of load it expects to shed during a system event. The SDT believes that the obligation is covered by Requirement R9 and Requirement R10. The SDT has revised characteristic 9 (Requirement R10) to specify that "Each Transmission Owner and Distribution Provider shall provide load tripping in accordance with the UFLS program designed by the group of Planning Coordinators for each region in which they operate." The measure by which compliance with the Requirement will be assessed will be defined in the Measures section of the proposed standard. 5. We are not clear as to the intent or purpose of Characteristic #1. We recommend that this characteristic be removed since the regional standards will require each entity to set their UFLS equipment that they own and thereby would cover the necessary system boundaries. If there is some other intent to this characteristic, we ask that the SDT explain further and then clarify the wording. **Response:** Applicability is now being identified in the proposed continent-wide standard. The SDT has also clarified requirements

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		concerning identification of islands in Requirements R3, R4 and R5.
American Transmission Company	Yes	Requirement 10.1: Change "through dynamic simulations" to "through analytical studies" because verification of meeting some performance requirements can be performed with other types of methods and simulations.
Response: SDT believes it is not possible to verify that the adequacy of the implementation of the regional UFLS program meets the performance characteristics without some sort of dynamic simulation.		
Entergy	Yes	We agree with and support the SERC comments.
Response: Please see response to SERC comments.		
Southwest Power Pool	Yes	We would propose that the following statement be included in the UFLS Regional Reliability Standard Characteristics - "Each LSE in a BA footprint is to coordinate their participation in a UFLS program with the host BA." **Response:** The proposed continent wide standard includes requirements for Planning Coordinators, Transmission Owners, and Distribution Providers. The SDT does not agree that the commenter's proposal is needed in the proposed continent-wide standard.
Georgia Transmission Corporation	Yes and No	Each region is different in load to generation mix and transmission configuration. I do not believe that one rule can apply globally to all regions. Only regional stability studies can determine acceptable load shed steps and needs.
Response: Specifying performance characteristics is a reasonable means to set a minimum level of performance for regional UFLS programs without restricting flexibility to specify UFLS program design parameters that best accommodate regional needs. They establish common performance requirements to facilitate coordination between regions in an interconnection. They also ensure coordination with generator under-frequency trip points also being developed for PRC-024 in Project 2007-09, Generator Verification.		
PJM	No	
We Energies	No	
Exelon	No	
Ameren	No	

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Transmission Reliability Program	No	
Independent Electricity System Operator	No	
Duke Energy	No	
City Water, Light & Power - Springfield, IL	No	
Grand River Dam Authority	No	
ERCOT	No	
American Electric Power (AEP)	No	
Louisiana Generating, LLC	No	