Background:

The Frequency Response SAR drafting team thanks all commenters who submitted comments on the first draft of the Frequency Response SAR. The SAR was posted for comment from January 17 – February 17, 2005. The SAR drafting team asked stakeholders to provide feedback on the SAR through a special SAR Comment Form. There were 30 sets of comments.

Based on the comments received, the drafting team has revised the SAR and is reposting it for an additional 30-day comment period

In this 'Consideration of Comments' document, stakeholder comments have been organized so that it is easier to see the summary of changes being requested of the SAR. All comments received on the first draft of the Frequency Response SAR can be viewed in their original format at:

ftp://www.nerc.com/pub/sys/all_updl/standards/sar/Frequency_Response_SAR_Comments_02_17_05.pdf

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 Cauley at 609-452-8060 or at gerry.cauley@nerc.net. In addition, there is a NERC Reliability Standards Appeals Process.[1]

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

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1. Do you agree there is a reliability need for specifying the quality and quantity of frequency response?

Summary Consideration: Most commenters agreed that there is a reliability need to specify the quality and quantity of frequency response.

Commenter	Yes	No	Comment
MAAC Staff (2) Al DiCaprio – MAAC (2) Joe Willson – MAAC (2) Mark Kuras – MAAC (2)		✓	There is a need for governors but not for frequency response. Governors are needed to resynchronize during restoration. But the need for a short-term frequency response characteristic has been obviated by the pending Version1 Balancing Standard. That standard is designed to ensure that interconnection frequency is never at such a level that the loss of the largest contingency will cause instability or cascading outages. If the system is always in such a state why would the instantaneous response to the loss of a single contingency add to the system reliability? The SAR has not provided any definitive need. The SAR has not provided sufficient focus vis-à-vis who is responsible to meet the standard (the generator, the BA, the Load, the RA) This proposal has not provided any additional information concerning the need for this proposed Standard since the last time (during the Balancing Resources and Demand consensus) that a similar Frequency Response Requirement was overwhelming rejected by those who commented to that proposal. Transient frequency response has not been the target of any major public concern. The current Version 1 Control Standard proposal provides limits on the frequency excursions that can be controlled by system-operators and their control systems. Relays and other Protection Devices serve to protect those time frames too short for an operator to respond to. What does this standard add? **Comments** This SAR is not clear as to what it really is intended to mandate. Does the requestor want to create a standard for Generator Owners to install governors? Or a standard on Generator Operators for individuals unit governor response? Or a standard for Balancing Authorities for Area response? Or for Reliability Authorities for Regional response? All of these are different requirements and have different effects. The requestor must be clear as to what is intended. To ensure that frequency doesn't hit a relay limit (as in the Balancing standard?) or is it to address the need for governors when synchronizing? When does the standard apply? All times (which means that NERC can go to a unit, BA or RA to check that some finite response is available?) Just at times when large events occur (the problem is of course whether or not the outage is near or far from the entity being checked)? Only during test conditions (since a unit under stress – 'valves wide open' has not governor response at that time – even though it may have the greatest of

Commenter	Yes	No	Comment
			responses at other times). The requestor's intent may be laudable but the description is no where near ready to be considered as 'standard material'.
Response: The drafting team (Resources Subcommittee Frequency Task Force) attempted to answer many of the questions raised by the commenters in the Frequency Response Standard Whitepaper. We agree that the standard needs to be clear to who and when it would apply and this is addressed in the revised SAR. While the Interconnections may have sufficient frequency response for normal operations, we don't know how this response is dispersed and at what point it will pose a reliability risk. A primary purpose of this standard is to collect information so informed decisions can be made before there is a problem. We disagree that the Balance Resources and Demand (BRD) standard is sufficient for all operating states. The BRD addresses steady state and fully interconnected conditions. Refer to "A New Thermal Governor Modeling Approach in the WECC" by Les Pereira, John Undrill, Dmitry Kosterev, Donald Davies, and Shawn Patterson. Also, keep in mind that response has continued to decline since the last published study, even though it should be increasing with load growth. As you request, the draft standard addresses who is required to meet the standard (BA). The standard will be designed such that a BA can mirror the metrics within its boundaries (evaluate generators and LSEs) if they so choose. The standard is not intended to establish a large set of arbitrary requirements, but will establish the framework to collect the information to make informed engineering decisions. The revised SAR clarifies what is expected.			
BPA Bart McManus Brian Tuck James Randall Francis Halpin Bill Mittlestat James Murphy		✓	NERC should not involve itself in the development of these standards and should allow individual interconnections to address frequency response issues independently. For example, the WECC is currently working on standards that will address this concern. They will be tailored to the specific requirements of this interconnection and will provide the best possible solution to the problem. There may be a need to specify frequency response requirements within some interconnections; however, it is not necessary, or most effective for them to be defined at the NERC level.
Response: The Resources Subcommittee Frequency Task Force agrees that frequency response is primarily an Interconnection issue and, as envisioned, the proposed standard would accommodate Interconnection differences both in amounts of response and methodology in calculating response. The standard would identify technical and engineering principles that should be met to calculate and evaluate the amount and distribution of frequency response within each Interconnection. The drafting team believes that stakeholders would prefer the assurance of knowing that NERC is providing oversight to ensure that all Interconnections have a technically sound basis for the development of respective frequency response requirements.			
FRCC (2) Linda Campbell Ron Donahey – TEC (1) Mark Bennett – GRU (3) Steve Wallace – SEC (5) S. McElhaney – FMPA (5) Ted Hobson – JEA (1)		✓	The FRCC does not support the development of a Frequency Response Standard at this time. A standard for each Interconnection, although informative would be unenforceable as far as identifying short term, frequency response deficient, entities or areas. As such measurability and compliance by the relevant entities would be all but impossible. As far as an Interconnection allocation program for frequency response, we feel that the "apparent" decline in response is not significant enough to warrant a standard at this time and we would require additional details of how such a plan would be implemented and the potential economic impacts on the Regions that would be

Commenter	Yes	No	Comment
			associated with that plan.
Response: The standard as envisioned does not mandate a specific amount of frequency response. With regard to the "apparent" decline in frequency response, the most widely published report (Ingleson and Nagle, 1999) documented a change in Eastern Interconnection response from 3750MW/0.1Hz in 1994 to 3390MW/0.1Hz in 1998. The Resources Subcommittee evaluation of 44 events in 2005 showed an average frequency response well below 3000MW/0.1Hz. Theoretically, response should be increasing over time with increasing load and generation in an Interconnection. One of the primary reasons for the standard is to enable a better analysis of response and also enable informed decisions. As envisioned, the standard will provide a fairly simple methodology to verify compliance.			
ISO/RTO Standards Review Committee (2) K. Tammar – NYISO (2) D. McMaster – AESO (2) Ed Riley – CAISO (2) Sam Jones – ERCOT (2) P. Henderson – IESO (2) P. Brandien – ISO-NE (2) B. Phillips – MISO (2) B. Balmat – PJM (2) C. Yeung – SPP (2)	✓	✓	We agree in general that there is a reliability need to have frequency response, particularly during disturbances, islanding and restoration. The standard should provide the process for a technically sound calculation of frequency response and bias (both fixed and variable). Any new standards on frequency response need not and should not be onerous by finding BAs noncompliant with response less than average or below some un-validated norms. If performance is significantly less than an Interconnection norm, the standard should not trigger an automatic non-compliance. In these situations the BA should perform an internal review/assessment that ensures governors are working as designed, that the BA knows which resources are frequency responsive (so the information can be included in restoration plans), whether governors can be triggered to be more responsive during disturbances, etc and satisfy the Interconnection requirement. If the Interconnection requirement is not met within a reasonable timeframe then the BA should be deemed as non-compliant. When required, the validation of governor performance could be achieved either through online monitoring in an EMS or periodic testing (both methods should be explained in a reference document to support the standard). The standard should acknowledge that some units might not provide response under normal operations (e.g. nuclear units operating at full load) and that response is highly variable event-to-event based on simultaneous load changes. The standard should acknowledge the differing Interconnection requirements (smaller Interconnections need greater response). The standard should also track Interconnection and BA areas response over time (years) and be reevaluated as performance changes.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. As envisioned, the standard would not mandate a given amount of response, but would require			

Commenter	Yes	No	Comment
an analysis if response were measurably below the norm (this detail has been added to the detailed description in the SAR). There is another standard under development, (Phase III & IV MOD-027 - Verification and Status of Generator Frequency Response) that requires Generator Owners to verify that their governors are working as designed. The standard would accommodate the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee Frequency Task Force has a tool that could calculate the BA's performance to the standard. The SAR was also changed to reflect the suggestions to accommodate: • Both fixed and variable bias. • Cases where a specific unit (e.g. nuclear) is prohibited from providing frequency response. • Differing Interconnection needs.			
CAISO (2) Ed Riley Yuri Makarov Steve McCoy	✓		Frequency response provided by speed governors and loads helps to prevent load shedding and generator trips at significant frequency excursions caused by sudden active power mismatches in the systems. Without a sufficient frequency response emerging during the first seconds after a frequency disturbance, there is a danger of further cascading development or frequency instability and system collapse cased by underfrequency generator trips. It has been already noted that insufficient frequency response in some parts of an Interconnection may cause certain temporary redistribution of power flows and reduce stability margins after frequency disturbances that may limit the OTC on critical paths within the Interconnection. It has been also observed that insufficient frequency response may cause a weaker frequency recovery that bears a greater risk of system collapse at subsequent frequency disturbances. Therefore, frequency response is definitely a reliability issue that needs to be addressed by a NERC standard.
Response: The Resources Subcommittee Frequency Task Force agrees that there are several issues that must be addressed in the standard or in supporting business practices. As envisioned, the proposed standard would not be prescriptive with regard to "how much" and "where" the response is carried.			
Manitoba Hydro (1, 3, 5, 6) Gerald Rheault	✓		Manitoba Hydro , from a reliability perspective, supports the idea of specifying the quantity and quality of frequency response and incorporating these elements in a Standard. However, the development of this standard should not be rushed since the evidence provided in the Standard Authorization Request form and in the Frequency Response Standard White paper shows that current frequency response and projected frequency response trends do not pose a significant potential for compromising system reliability and for major under-frequency load shedding to occur in the near term. Also in the section of the white paper which examines "frequency response standard considerations", a broad scope and outline is given, more detail is required especially regarding methods of ensuring compliance. In paragraph 2, page 9 of the white paper where the current frequency response of the Eastern Interconnection is stated as 3100 MW/0.1 Hz with a standard deviation of 1870 MW/0.1 Hz and the statement is made that "the fact that an under-frequency

Commenter	Yes	No	Comment
			event has not happened yet is only coincidence" requires much more detailed information regarding the origin and calculations of these numbers before these assumptions can be made. Could it be that instead of a frequency response closer to 1230MW/ 0.1 Hz it is actually practically closer to 3100 MW/ 0.1 Hz or even 4970 MW/ 0.1 Hz most of the time? One understandable major concern addressed in the white paper is the response of combined-cycle units to frequency decline and the fact that due to a drop in combustion air volume their output may actually decrease with a drop in frequency or even result in unit tripping. Also there was concern with the possibility that larger amounts of these types of units will be installed on the system thereby potentially increasing the decline in frequency response rate from 70 MW/ 0.1 Hz /Year (Eastern Interconnection) . It is also mentioned (on page 10) that with proper tuning combined cycle units can provide correct frequency response. Maybe part of the focus should be on finding ways of enforcing the Current Requirements (Page 14) and including specific frequency response requirements for combined-cycle units.
Response: The Resources Subcommittee Frequency Task Force agrees that the standard should not rush to a decision on the amount and location of frequency response, but should set the framework for making informed decisions. Frequency response is needed for more than protection against UFLS. Response is also needed during disturbances and restoration. With regard to "current requirements", the Whitepaper listed what existed in NERC Policy, mostly as guides. There is very little in the V0 Standards regarding governors or frequency response. We agree that the standard should not impose unreasonable costs to demonstrate compliance. We agree that frequency response should be monitored both at the BA and Interconnection level. Characterizing how frequency response changes under varying interconnection load and unit commitment conditions will be addressed by a sampling methodology. The drafting team is pursuing the addition of functionality in the "NERC –ACE monitoring application" that will identify generator trips and automate the calculation of Interconnection frequency response. Evidence to date indicates that frequency response declines significantly during light load periods, even though the exact mechanism for this is not well defined. Most of the major frequency excursions experienced in the Eastern Interconnection have occurred during the shoulder period of the year during either the early morning or late evening periods. Regarding the last comment, there currently are no governor or frequency response requirements for generators.			
Energy Mark, Inc. (8) Howard Illian	✓		There is a reliability need but it is not an immediate reliability need for all of the interconnections. The amount of Frequency Response on the Texas Interconnection is close to the minimum acceptable amount, and therefore, there is an immediate need for a FRS on the Texas Interconnection. On the Western Interconnection, the WECC keeps close tabs on Frequency Response and takes immediate action when a problem arises with frequency response on that interconnection. Although there is no immediate need for a Frequency Response Standard on the Western Interconnection at this time, the observed reductions in Frequency Response on that interconnection make this issue an ongoing concern. Finally, there is no current need for a Frequency Response Standard on the Eastern Interconnection because current Frequency Response is adequate. However, it

Commenter	Yes	No	Comment
			takes significant time to develop an effective standard and put it in place. The Balancing Resources and Demand Standard is entering its fourth year of development with expectations of at least another year before implementation. A Frequency Response Standard would be expected to take a similar period to develop. That means that it will be at least 2010 before a new FRS would be put in place. There is no question that adequate Frequency Response is required for reliability. There is no question that Frequency Response on the Eastern Interconnection is declining. There are two paths of action available; 1) Wait until adequate Frequency Response causes reliability problems and then begin the five year process to develop a standard; 2) Begin development of a FRS and determine the final need for implementation during the five year development process. I would rather have a standard that requires measurement that does not result in enforcement action, and therefore, has no effect on operations, than not have a standard when there are definite reliability problems. It will be much easier to implement a standard for Frequency Response before reliability problems occur than to implement a standard after reliability problems occur. NERC should develop a Frequency Response Standard and continue to investigate the need for the standard during its development.
Response: The Resources Subcommittee Frequency Task Force agrees with the comments that the standard should initially focus on measuring the amount of response and not impose restrictions on current operations. As envisioned, the proposed standard would identify a consistent, objective calculation of frequency response The standard would require regional and local analyses when BAs have low response. This way, informed technical decisions can be made prior to reaching a point where reliability is truly threatened.			
MAAC (2) John Horakh	✓		There may be a reliability need in the near future. The white paper does an excellent job of making that case. For the purpose of commenting on a SAR that has not yet produced a proposed Standard, I can give it the benefit of the doubt and say yes, there is reliability need.
Response: The Resources Subcommittee Frequency Task Force appreciates your support and agrees that there is a reliability need for this proposed standard.			
MRO (2) Larry Larson – OTTP Al Boesch – NPPD Terry Bilke – MISO R. Coish – MH Dennis Florom – LES K. Goldsmith – Alliant Todd Gosnell – OPPD W. Guttormson – SaskPwr Jim Maenner – WPS Tom Mielnik –	✓		We agree (with qualifications). Any new standards on frequency response need not and should not be onerous (identifying BAs noncompliant with less than average response or some un-validated norms). The standard should provide the process for a sound calculation of frequency response and bias (both fixed and variable). There may be valid reasons why a BA is below observed norms in response. It may meet most of its obligations with schedules. Rather than generate an automatic non-compliance when response is below some benchmark, the standard should require

Commenter	Yes	No	Comment
MidAmerican Darrick Moe – WAPA Joe Knight – MRO			an internal review that ensures governors are working as designed, that the BA knows which resources are frequency responsive (so the information can be included in restoration plans), whether governors can be put in more responsive modes during disturbances, etc. The standard should have some requirements on generators if the BA is not providing the response outlined in the standard (governors should be working as designed). The standard should also track Interconnection response over time and identify a target response (different for each Interconnection). NERC or NAESB will want to look at how this is allocated to BAs and generators.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. As envisioned the proposed standard would not mandate a given amount of response, but would require an analysis if response is measurably below the norm. As envisioned the proposed standard is would acknowledge the variability inherent in measuring frequency response and would provide two methods of capturing sufficient samples to make an objective measurement. The standard would not preclude market solutions. The SAR detailed description has been expanded to state that the standard will include a sound calculation for measuring frequency response with consideration of interconnection specifics. Another detail added to the SAR requires generator units with nameplate ratings of 10 MW or greater to be equipped with governors. There is another standard under development, (Phase III & IV MOD-027 - Verification and Status of Generator Frequency Response) that requires Generator Owners to verify that their governors are working as designed. Finally, the SAR was modified to accommodate both fixed and variable bias.			
Southern Company Transmission, Operations, Planning and EMS Divisions (1) Marc Butts Steve Corbin Jim Viikinsalo Jim Griffith Doug McLaughlin Monroe Landrum	✓		Trends in Eastern and Western Interconnection Turbine Governor Response and primary frequency response over the past two decades (as documented by EPRI Project RP2473-53 and Decline of Eastern Interconnection Frequency Response by Ingleson and Nagle) as well as trends in frequency error magnitude and variance over the past five years (as documented by the NERC Resources Subcommittee at URL http://www.nerc.com/~filez/rs.html) indicate that significant frequency response degradation is occurring, particularly in the Eastern Interconnection. While not yet a crisis, these trends are indicative of significant changes in design and operational practices on the interconnected electrical systems of North America which, if not managed intelligently, can cause significant degradation in reliability. We strongly urge the industry to support this SAR and begin the process of controlled management before the processes behind these trends reach crisis proportion.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
New York ISO (2) Mike Calimano	✓		We agree in general that there is a reliability need to have frequency response, particularly during disturbances, islanding and restoration. The standard should provide the process for a technically sound calculation of frequency response and bias (both fixed and variable). Any new standards on frequency response need not and should

Commenter	Yes	No	Comment
			not be onerous by finding BAs noncompliant with response less than average or below some un-validated norms. There may be valid reasons why a BA is below observed norms in response. For example, the BA may meet most of its obligations with schedules or its native load may be non-responsive. If performance is significantly less than an Interconnection norm, the standard should not trigger an automatic non-compliance. In these situations the BA should perform an internal review/assessment that ensures governors are working as designed, that the BA knows which resources are frequency responsive (so the information can be included in restoration plans), whether governors can be put in more responsive modes during disturbances, etc. When required, the validation of governor performance could be achieved either through online monitoring in an EMS or periodic testing (both methods should be explained in a reference document to support the standard). The standard should acknowledge that some units might not provide response under normal operations (e.g. nuclear units operating at full load) and that response is highly variable event-to-event based on simultaneous load changes. The standard should acknowledge the differing Interconnection requirements (smaller Interconnections need greater response). The standard should also track Interconnection response over time (years) and be reevaluated as performance changes.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. As envisioned, the standard would not mandate a given amount of response, but would require an analysis if response were measurably below the norm (this detail has been added to the detailed description in the SAR). There is another standard under development, (Phase III & IV MOD-027 - Verification and Status of Generator Frequency Response) that requires Generator Owners to verify that their governors are working as designed. The standard would accommodate the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee Frequency Task Force has a tool that could calculate the BA's performance to the standard. The SAR was also changed to reflect the suggestions to accommodate: • Cases where a specific unit (e.g. nuclear) is prohibited from providing frequency response. • Differing Interconnection needs.			
IESO (2) Pete Henderson	✓		We agree in general that there is a reliability need to have frequency response, in order to maintain interconnection frequency and particularly during disturbances, islanding and restoration. The standard need to address both the system needs as well as island requirements for frequency response. The standard should provide the process for a technically sound

Commenter	Yes	No	Comment
			calculation of frequency response and bias. The standard should acknowledge that some units might not provide response under normal operations (e.g. nuclear units operating at full load) and that load response is highly variable event based on time of day or year. The standard should acknowledge smaller areas need greater response. Where BA areas are deficient in meeting the interconnection requirement , they should be allowed a reasonable period of time to take appropriate steps to make corrections before being assessed as non compliant. The standard should also track area response over time (years) and be reevaluated as performance changes. Quality should be defined. For generators it should include dead-band, droop characteristics, etc.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. As envisioned, the standard would not mandate a given amount of response, but would require an analysis if response were measurably below the norm (this detail has been added to the detailed description). The standard accommodates the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee Frequency Task Force has a tool that will calculate the BA's performance to the standard. The Resources Subcommittee Frequency Task Force agrees with your "governor quality" comment and has added governor installation and operation details to the SAR's detailed description. As envisioned, the standard will provide the Balancing Authority with sub-par frequency response time to analyze their situation and make necessary changes and corrections.			
ATC (1) Peter Burke	✓		Based on the NERC white paper Frequency Response Standard Whitepaper dated April 6, 2004 that was prepared by the Frequency task Force of the NERC Resources Subcommittee, it would appear that the decline in frequency response of both the Eastern and Western Interconnections is a reliability concern. As a transmission provider, however, there is probably little that can be done other than make sure that governor response and load modeling can be made as accurate as reasonably possible in conducting dynamic simulations and be aware of this issue in studying existing as well as new generating facilities. The control area, generation operators and turbine-generator manufacturers need guidance provided as to their responsibilities and obligations regarding frequency response. Changes in the load characteristics (e.g. fewer large motors, variable speed drives, etc) over time, plus changes in reserve sharing practices brought on by deregulation and competition are and will affect load response to frequency excursions. The type of generation (e.g. combustion turbine units, combined-cycle units) being interconnected to the system as well as the operation of the

Commenter	Yes	No	Comment
			governors (e.g. blocked or improper settings) and turbines (e.g. sliding pressure, boiler-follower, etc.) of existing generators have a significant effect on the system frequency response.
Response: The Resources Subcommittee Frequency Task Force agrees with your technical comments in support of this standard. The team also supports the development of the planning "MOD" standards that address frequency response at the generator level.			
NERC Frequency Task Force Raymond L. Vice, Chairman	✓		Trends in Eastern and Western Interconnection Turbine Governor Response and primary frequency response over the past two decades (as documented by EPRI Project RP2473-53 and Decline of Eastern Interconnection Frequency Response by Ingleson and Nagle) as well as trends in frequency error magnitude and variance over the past five years (as documented by the NERC Resources Subcommittee at URL http://www.nerc.com/~filez/rs.html) indicate that significant frequency response degradation is occurring, particularly in the Eastern Interconnection. While not yet a crisis, these trends are indicative of significant changes in design and operational practices on the interconnected electrical systems of North America which, if not managed intelligently, can cause significant degradation in reliability. I strongly urge the industry to support this SAR and begin the process of controlled management before the processes behind these trends reach crisis proportion.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
Robert Blohm	✓		The CPS1 equation is a single equation in two variables, primary (governor) response and secondary response. Two variables require two equations in order to have a unique solution. That second equation does not currently exist and must be the proposed Frequency Response standard that pins down the value of primary (governor) response. Currently, the single CPS1 equation allows any Balancing Authority an infinity of solutions for any given CPS1 value. Accordingly, Balancing Authorities have been tending to reduce expensive primary response and increase cheaper secondary response (AGC, regulation, load following) to achieve a given CPS1 score, which is an average over time. The result has been a halving of system bias in the Eastern
Response: The Resources Subcommittee Frequency Task Force appreciates your comment and your support for the frequency response standard.			
SPP Operating Reliability Working Group Robert Rhodes –SPP (2) Ron Ciesiel – SPP (2) Bob Cochran – SPS (1) Mike Gammon – KCPL (1) Steve Hillman – WPEK (1) Allen Klassen – Westar	✓		A frequency response standard is needed but only within the scope and range of the previously provided guides in Policy 1 such as a design criteria of 5% droop, a 36 mHz deadband with exclusions for nuclear, combined cycle and small generating units.

Commenter	Yes	No	Comment
(1) Bill Nolte – SECI (1) Mike Stafford – GRDA (1)			
Response: The Resources Subcommittee Frequency Task Force agrees with the comments and has added statements to the detailed description to reflect the comments. However, the SAR is intended to capture the scope of the standard and the specific parameters will be determined by the standard drafting team.			
Southern Co. Generation (6) Roman Carter Tony Reed Joel Dison Lucius Burris Lloyd Barnes Clifford Shepard Terry Crawley Roger Green Tom Higgins	✓		Trends in Eastern and Western Interconnection Turbine Governor Response and primary frequency response over the past two decades (as documented by EPRI Project RP2473-53 and Decline of Eastern Interconnection Frequency Response by Ingleson and Nagle) as well as trends in frequency error magnitude and variance over the past five years (as documented by the NERC Resources Subcommittee at URL http://www.nerc.com/~filez/rs.html) indicate that frequency response degradation is occurring, particularly in the Eastern Interconnection. While not yet a crisis, these trends are indicative of significant changes in design and operational practices on the interconnected electrical systems of North America which, if not managed intelligently, can cause degradation in reliability. We support this SAR in an effort to begin the process of controlled management before the processes behind these trends reach crisis proportion.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
TXU Energy Delivery Roy Boyer	✓		Yes, I agree there is a reliability need for specifying the quality and quantity of frequency response. There is ample evidence that specifying a droop value or that specifying governors must be in operation will not necessarily result in any useful governor response to a sudden large drop in system frequency. So yes, I think a SAR team should look into this matter. I would suggest the part load can play in arresting frequency decline be included in the scope. I would also suggest that the frequency response needs of the regions will likely vary, so final specific requirements should probably be made at the region level.
Response: The Resources Subcommittee Frequency Task Force agrees that load can provide frequency response and load contribution is, by default, included in the balancing authority's performance. The standard is indifferent to whether response is provided by load or generation. The proposed standard recognizes the role and importance of both the Interconnection and the Regional Reliability Organization in the establishment of requirements. In general, it is expected there is a "base" Interconnection target response that will be addressed in this standard. Each Interconnection would have a different target, based on its size and historic response. There are areas (e.g. Maritimes) that require additional response. It is expected these unique situations will be primarily addressed in the "MOD" standards. This standard would enable improved data for the MOD standards.			
MISO Terry Bilke	✓		These are my individual comments as a member of the NERC Resources subcommittee and not those of representing any organization. There is a reliability need for a light-handed standard that allows us to do a better job of ensuring response is available when

Commenter	Yes	No	Comment
			required. As some entities might comment, there is adequate response in all interconnections during "system normal" conditions. The problem is what occurs during major disturbances and restoration. A primary reason the industry needs to do a better job of tracking frequency response is the fact that response is declining when it should actually be increasing with load and generation growth. The standard should not be structured such that it finds BAs noncompliant if response is below average or if response is low for a given event. Frequency response at the BA level is extremely variable as the measure is mingled with load fluctuation. The standard should guide a technically sound calculation of response at the BA level and track interconnection performance over time to enable informed decisions. If a BA performs significantly below an Interconnection norm, the standard should require the BA do an internal assessment of its key generation to verify governors are working as designed and that there will be frequency responsive resources for disturbances and restoration. If Interconnection response significantly changes over time, the standard should be reevaluated.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
TXU Electric Delivery (1) Travis Besier or Ellis Rankin	✓		TXU Electric Delivery proposes that Frequency Response Guidelines at the NERC level should only be in general terms and require that each Reliability Authority establish a specific Frequency Response Standard with detailed specifications as appropriate for its region.
Response: The Resources Subcommittee Frequency Task Force intent was not to mandate a specific amount of frequency response, but to require a consistent, objective calculation of frequency response. The balancing authority and the Regional Reliability Organization must do an assessment of adequacy if response is measurably below the norm. The proposed standard recognizes the role and importance of the Interconnection and the Regional Reliability Organization in the establishment of requirements. In general, it is expected there is a "base" Interconnection target response that will be addressed in this standard. Each Interconnection would have a different target, based on its size and historic response. There are areas (e.g. Maritimes) that require additional response. It is expected these unique situations will be primarily addressed in the "MOD" standards. This standard would enable improved data for the MOD standards.			
TVA (1) Kathie Davis Larry Akens Mitch Needham Chuck Feagans	✓		

Commenter	Yes	No	Comment
Ed Forsythe			
Alliant Energy (1) Kenneth A. Goldsmith	✓		
Progress Energy – Carolinas (1, 3, 5, 6) Phil Creech	✓		
Dick Schulz Chair, IEEE Task Force on Large Interconnected Power System Response to Generation Governing	✓		
NCPA (4) Les Pereira	✓		
NPCC CP9, Reliability Standards Working Group Guy V. Zito – NPCC (2) Ralph Rufrano – NYPA (1) K. Goodman – ISONE (2) Al Adamson – NYSRC (2) Bob Pelligrini – UI (1) D. Kiguel – Hydro One (1) P. Lebro – Nat'l Grid (1) R. Champagne – TE (1) B. Hogue – NPCC (2) K. Khan – IESO (2) M. Potishnak – ISONE (2) G. Campoli – NYISO (2)	✓		
New York State Reliability Council (2) Theodore Pappas	✓		
We Energies (3, 4, 5) Howard Rulf	✓		
Calpine (6) James Stanton	✓		

2. Do you agree with the scope and applicability of the proposed standard?

Summary Consideration: Most commenters agreed that the proposed standard should apply to the Reliability Authority (or Reliability Coordinator), Balancing Authority and Generator Operator. With the revisions to the SAR, there are requirements for the Generator Owner to ensure that certain governors meet a minimum set of criteria

There was no consensus amongst commenters on the scope of the proposed standard. The drafting team made extensive changes to try to better define the scope.

Commenter	Yes	No	Comment
MAAC Staff (2) Al DiCaprio – MAAC (2) Joe Willson – MAAC (2) Mark Kuras – MAAC (2)		✓	Frequency Response characteristics should be dictated by the Reliability entities as part of their respective control services to meet the regional synchronizing requirements as well as the longer duration control standards and of the needs of the interconnection in which they operate.
Response: The Resources Subcommittee Frequency Task Force's intent is that the standard be designed such that a BA can mirror the metrics within its boundaries (evaluate generators and LSEs) if it so chooses.			
BPA Bart McManus Brian Tuck James Randall Francis Halpin Bill Mittlestat James Murphy		✓	The main theme that there needs to be a relationship between response and frequency decline is the right approach but requirements would be different from region to region. Standards to manage frequency response should be developed by individual interconnections; not NERC. The scope and applicability should be defined by the needs of the interconnection to provide the most benefit to system wide reliability.
Response: The Resources Subcommittee Frequency Task Force agrees that frequency response is primarily an Interconnection issue and, as envisioned, the Standard would accommodate Interconnection differences both in amounts of response and methodology in calculating response. The drafting team believes that stakeholders would prefer the assurance of knowing that NERC is providing oversight to ensure that all Interconnections have a technically sound basis for the development of respective frequency response requirements.			
NPCC CP9, Reliability Standards Working Group Guy V. Zito – NPCC (2) Ralph Rufrano – NYPA (1) K. Goodman – ISONE (2) Al Adamson – NYSRC (2) Bob Pelligrini – UI (1) D. Kiguel – Hydro One (1) P. Lebro – Nat'l Grid (1) R. Champagne – TE (1) B. Hogue – NPCC (2) K. Khan – IESO (2) M. Potishnak – ISONE (2)		✓	The applicability of this Standard to the LSE should be considered.

Commenter	Yes	No	Comment
G. Campoli – NYISO (2)			
Response: The Resources Subcommittee Frequency Task Force will add LSE to the standard's applicability list.			
MAAC (2) John Horakh		✓	Quoted from the SAR (with corrections): This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses of the system to these events. Also quoted: The measurement selected must be accurate and, to the extent practical, easy to implement. This seems more like a research project than a request for a standard. There is no mention of any possible measurements that might be in the standard. I'm afraid that proceeding with such a vague idea of a measurement will lead the SAR or later Standard to become bogged down with research and field testing even more so than the Balance Load and Demand Standard. And Balance Load and Demand did have definite measurements in mind, thereby not requiring much research, mainly field testing. Come back with a SAR after the research is done, or at least started.
Response: The Resources Subcommittee Frequency Task Force agrees that the whitepaper bears some resemblance to the description for a research project. Many in the industry are concerned with the decline in Frequency Response, while at the same time some are asking how much of a problem is the decline in response. The drafting team's goal is to put the infrastructure and process in place to make informed decisions in the future and to allow the Regions to evaluate the distribution and adequacy of response and take mitigating action if there are areas found to be deficient. The Resources Subcommittee Frequency Task Force disagrees with delaying the standard development. The SAR will define the scope of the standard. The specific detailed requirements and measures will be developed by the standard drafting team.			
TVA (1) Kathie Davis Larry Akens Mitch Needham Chuck Feagans Ed Forsythe		✓	If the purpose is to purchase frequency response, then the Market Operator needs to be includes. Will this be considered an Ancillary Service? Others that may need to be involved are Transmission Service Provider, Generator Owner, Planning Authority and Resource Planner. Applicability should include #2
Response: The Resources Subcommittee Frequency Task Force agrees that others have roles in providing Frequency Response, but have focused on the higher level calculation of response at the balancing authority and Interconnection level. The primary reason for this is that there are about 150 balancing authorities. Only those balancing authorities with sub-normal response need to investigate to the generator level. The NERC 2002 Generating Unit Statistical Brochure identifies 3694 generators of 1 MW or greater. It would be difficult (and unnecessary if the BA has good response) to monitor thousands of generators with this standard. The standard doesn't preclude market solutions, which NAESB may adopt. The Resources Subcommittee Frequency Task Force agrees with the comment to include #2 in the SAR.			
ISO/RTO Standards Review Committee (2) K. Tammar – NYISO (2) D. McMaster – AESO (2) Ed Riley – CAISO (2) Sam Jones – ERCOT (2)		✓	There is a general need for a standard, but the outcomes and expectations should address the comments raised in question 1. While we agree that the standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met), we have concerns with the statement *There must be a means for sale/purchase of frequency response as for any other quantity.*

Commenter	Yes	No	Comment
P. Henderson – IESO (2) P. Brandien – ISO-NE (2) B. Phillips – MISO (2) B. Balmat – PJM (2) C. Yeung – SPP (2) New York ISO (2) Mike Calimano			It is not clear what is meant by *A method of allocation must be developed."* Is this an allocation of Interconnection response to BAs, BA allocation to generators or something different?
Response: The Resources Subcommittee Frequency Task Force agrees with these comments, and has revised the SAR to omit the italicized statements. As envisioned, the proposed standard would not mandate a given amount of frequency response, but would require an analysis if response were measurably below the norm. The standard doesn't preclude market solutions, which NAESB may adopt.			
NCPA (4) Les Pereira		✓	The scope needs to be expanded – see detailed comments in a following section – based on extensive modeling and validation work in WECC.
Response: The Resources Subcommittee Frequency Task Force appreciates the significant work that has been done in this area by the WECC and has referenced some of this research in the Whitepaper. We believe the Planning Standards under development (MOD-13 and MOD-27) deal with the governor issues that you outline. As envisioned, this standard will provide improved data into the modeling process.			
FRCC (2) Linda Campbell Ron Donahey – TEC (1) Mark Bennett – GRU (3) Steve Wallace – SEC (5) S. McElhaney – FMPA (5) Ted Hobson – JEA (1)		✓	The SAR indicates a measure of frequency response for the Interconnection, as a measure of performance. This would be very difficult to translate to individual entity compliance and thus render the standard applicable to no entities.
Response: The interconnection measure of response is intended as a benchmark and as a validation of the balancing authority's reported performance. The revised SAR indicates that if frequency response is outside the norm for the BA, based on its size, BAs and Regions would be required to conduct analyses to determine the reason for the performance.			
IESO (2) Pete Henderson		✓	The Frequency control standard needs to address levels required for reliability, be consistent and verifiable, and be simple to monitor for compliance purposes.
Response: This is the intent.			
Progress Energy – Carolinas (1, 3, 5, 6) Phil Creech	✓		Scope: The scope of the proposed standard is appropriate. However, the reliability requirements would be better addressed by a comprehensive review that considers the adequacy of existing reliability standards. Applicability: The applicability of the proposed standard is understood to be Reliability Authorities, Balancing Authorities, and Generator

Commenter	Yes	No	Comment
			Operators. However, substantial questions remain as to how the responsibilities implied in the proposed standard will be equitably distributed.
Response: The Resources Subcommittee Frequency Task Force appreciates your comment. The new standard for verifying generator governor controls will be under field test through part of 2007 and then will be finalized, balloted and then implemented. The implementation plan for MOD-027 includes additional time for entities to become compliant with the requirements. This would mean that any work on this standard could be delayed for several years. With the decline in Eastern Interconnection frequency response, the drafting team thinks it would be unwise to wait for the new standards to be developed and reviewed before developing this standard. Your questions regarding the applicability of the responsibilities will be better defined during the standard drafting phase of this standard.			
CAISO (2) Ed Riley Yuri Makarov Steve McCoy	✓		Generally, our answer is yes, but the matter of applicability needs a very careful consideration. The question is whether the proposed standard should be applied to only the reliability and balancing authorities and plant operators, or also to the resource and system planning authorities and generator owners. For example, wind generators do not provide a frequency response, whereas the response from the Combined Cycle units is limited. This is a matter of design as well as the matter of controllability of the primary energy source. If the generation portfolio contains a lot of wind and CC generators, the balancing authority cannot do much to improve its summary frequency response in general terms. Also, if frequency responsive generators in a CA are heavily loaded, would the new standard force the balancing authorities to re-dispatch generation in favor of non-responsive generation and commit more responsive generation ahead of the non-responsive generation? Another issue is whether the standard should specify the required response in the area or individual responses from generators. Perhaps, NERC should work with NASB to find the right answers before establishing the standard. One possible solution is to establish penalties for non-compliance that would stimulate generator owners to invest in frequency responsive generation. Another possible recommendation could be establishing a market for frequency response. Without resolving these difficult issues, this standard cannot be accepted.
Response: The Resources Subcommittee Frequency Task Force agrees that there are several issues that must be addressed in the standard or in supporting business practices. As envisioned, the draft standard would not be prescriptive with regard to “how much” and “where” the response is carried. The standard would allow balancing authorities, reliability coordinators, load-serving entities and Regional Reliability Organizations to make informed decisions based on their unique situation.			
Energy Mark, Inc. (8) Howard Illian	✓		Planning standards are not enough by themselves. Without continuous measurement, there can be no assurance that those responsible for meeting the reliability need for Frequency Response are fulfilling those responsibilities. Only a Frequency Response Standard that continuously measures response can insure that the response is available when required.
Response: The Resources Subcommittee Frequency Task Force agrees with your comment. The SAR drafting team will follow the Planning Standards under development (MOD-13 and MOD-27) that deal with governors and frequency response to be sure there are no conflicts.			

Commenter	Yes	No	Comment
TXU Energy Delivery Roy Boyer	✓		Yes, I agree.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
MISO Terry Bilke	✓		I agree, with some qualification. While the standard shouldn't preclude market solutions, I don't think it must enable a market as the scope implies. A little more clarity on the goals of the standard is needed.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments and has removed the reference in the original SAR to market solutions.			
Dick Schulz Chair, IEEE Task Force on Large Interconnected Power System Response to Generation Governing	✓		The proposed scope and applicability, to the extent that they are in the given in the SAR, are good.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
We Energies (3, 4, 5) Howard Rulf	✓		
Manitoba Hydro (1, 3, 5, 6) Gerald Rheault	✓		
Calpine (6) James Stanton	✓		
Alliant Energy (1) Kenneth A. Goldsmith	✓		
MRO (2) Larry Larson – OTTP Al Boesch – NPPD Terry Bilke – MISO R. Coish – MH Dennis Florom – LES K. Goldsmith – Alliant Todd Gosnell – OPPD W. Guttormson – SaskPwr Jim Maenner – WPS Tom Mielnik – MidAmerican Darrick Moe – WAPA Joe Knight – MRO	✓		
Southern Company Transmission, Operations, Planning and	✓		

Commenter	Yes	No	Comment
EMS Divisions (1) Marc Butts Steve Corbin Jim Viikinsalo Jim Griffith Doug McLaughlin Monroe Landrum			
NERC Frequency Task Force Raymond L. Vice, Chairman	✓		
Robert Blohm	✓		
SPP Operating Reliability Working Group Robert Rhodes –SPP (2) Ron Ciesiel – SPP (2) Bob Cochran – SPS (1) Mike Gammon – KCPL (1) Steve Hillman – WPEK (1) Allen Klassen – Westar (1) Bill Nolte – SECI (1) Mike Stafford – GRDA (1)	✓		
Southern Co. Generation (6) Roman Carter Tony Reed Joel Dison Lucius Burris Lloyd Barnes Clifford Shepard Terry Crawley Roger Green Tom Higgins	✓		
New York State Reliability Council (2) Theodore Pappas	✓		
TXU Electric Delivery (1) Travis Besier or Ellis Rankin	✓		

3. Do you believe these standards are more appropriately additions to existing standards as opposed to creating new standards?

Summary Consideration: There was no consensus amongst commenters on this issue. Refinement of this SAR was delayed for a year. During that time other related standards have undergone considerable development, and are on a schedule that would not be improved by the addition of the requirements envisioned with the Frequency Response standard. For these reasons, the drafting team is recommending that the new requirements for Frequency Response be in a new, stand-alone standard.

Commenter	Yes	No	Comment
BPA Bart McManus Brian Tuck James Randall Francis Halpin Bill Mittlestat James Murphy		✓	WECC has been working on frequency response standards for a few years and is close to finalizing standards specifically for the WECC interconnection. We do think there is a need for standardization of frequency response (clearly we do since WECC is doing it) BUT this standard should be developed at the Regional Council or Interconnection level and then adopted by NERC as a "Standard" with regional differences. Any new standards concerning frequency response should be developed by the individual interconnections.
Response: The Resources Subcommittee Frequency Task Force agrees that frequency response is primarily an Interconnection issue and the proposed standard accommodates Interconnection differences both in amounts of response and methodology in calculating response. The SAR's detailed description has been expanded to include broader parameters, including frequency response calculations that are Interconnection-specific. The drafting team believes that stakeholders would prefer the assurance of knowing that NERC is providing oversight to ensure that all Interconnections have a technically sound basis for the development of respective frequency response requirements.			
CAISO (2) Ed Riley Yuri Makarov Steve McCoy		✓	The new standard should a stand-alone standard because of its potential implications for control areas and the necessity to stage the implementation of the standard in coordination with resolution of the issues discussed above.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
Robert Blohm		✓	The SAR acknowledges that the proposed Standard not only is complementary to the Balancing Resources and Demand Standard, but also must be coordinated with that Standard. The two standards could be combined. But that is insufficient reason to oppose development of a separate Frequency Response Standard. Moreover, combining the standards would reverse the great progress made in consensus on the Balancing Resources and Demand Standard.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
MAAC (2) John Horakh		✓	Adding this requirement to another standard would only slow down the progress of both.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
ISO/RTO Standards Review		✓	Unless the Version 0 (BAL-003-0 — Frequency

Commenter	Yes	No	Comment
Committee (2) K. Tammar – NYISO (2) D. McMaster – AESO (2) Ed Riley – CAISO (2) Sam Jones – ERCOT (2) P. Henderson – IESO (2) P. Brandien – ISO-NE (2) B. Phillips – MISO (2) B. Balmat – PJM (2) C. Yeung – SPP (2)			Response and Bias) can be clarified and brought in line with this proposed standard, it should be stand-alone.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
NCPA (4) Les Pereira		✓	A new SAR will be more prescriptive, however there is also need for other related sections in NERC Operating Policy and Planning that need to be modified – see other comments below.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
IESO (2) Pete Henderson		✓	If the existing Frequency Response and Bias Standard Version 0 (Bal-003-0) can not be clarified and brought in line with this proposed standard, it should be standalone.
Response: The Resources Subcommittee Frequency Task Force agrees with this comment.			
MAAC Staff (2) Al DiCaprio – MAAC (2) Joe Willson – MAAC (2) Mark Kuras – MAAC (2)		✓	
Manitoba Hydro (1, 3, 5, 6) Gerald Rheault		✓	
We Energies (3, 4, 5) Howard Rulf		✓	
Calpine (6) James Stanton		✓	
TVA (1) Kathie Davis Larry Akens Mitch Needham Chuck Feagans Ed Forsythe		✓	
FRCC (2) Linda Campbell Ron Donahey – TEC (1) Mark Bennett – GRU (3)		✓	

Commenter	Yes	No	Comment
Steve Wallace – SEC (5) S. McElhaney – FMPA (5) Ted Hobson – JEA (1)			
New York ISO (2) Mike Calimano		✓	
New York State Reliability Council (2) Theodore Pappas		✓	
TXU Electric Delivery (1) Travis Besier or Ellis Rankin		✓	
NPCC CP9, Reliability Standards Working Group Guy V. Zito – NPCC (2) Ralph Rufrano – NYPA (1) K. Goodman – ISONE (2) Al Adamson – NYSRC (2) Bob Pelligrini – UI (1) D. Kiguel – Hydro One (1) P. Lebro – Nat'l Grid (1) R. Champagne – TE (1) B. Hogue – NPCC (2) K. Khan – IESO (2) M. Potishnak – ISONE (2) G. Campoli – NYISO (2)		✓	
Progress Energy – Carolinas (1, 3, 5, 6) Phil Creech	✓		The reliability requirements provided in the proposed standard would be better addressed by a comprehensive review that considers the adequacy of the existing reliability standards (i.e., 300 - Balance Resources and Demand)
Response: Frequency Response was consciously left out of the Balance Resources and Demand (BR&D) standard. We agree that the Frequency Response standard should complement the BR&D standard and believe it does.			
Energy Mark, Inc. (8) Howard Illian	✓		Frequency Response is closely related to the Frequency Bias used in the Balancing Resources and Demand Standard and therefore this standard should be included as an addition to that standard. If it is not included in the BRD Standard, a separate standard would require coordination between the two standards. This would make the process of updating the standards more complex.
Response: The Resources Subcommittee Frequency Task Force acknowledges that if the frequency response requirements and measures were to be included in another standard that the Balance Resources and Demand standards would be the most likely standard(s). The Resources Subcommittee Frequency Task Force is working with the Balance Resources and Demand standard drafting team to ensure that the efforts of both teams are coordinated.			

Commenter	Yes	No	Comment
Alliant Energy (1) Kenneth A. Goldsmith	✓		Version 0 of BAL-003-0, Frequency Response and Bias; or its successor.
Response: The Balance Resources and Demand standard drafting team has a successor version of Frequency Bias posted for review. The Resources Subcommittee Frequency Task Force is working with the Balance Resources and Demand standard drafting team to ensure that the efforts of both teams are coordinated.			
MRO (2) Larry Larson – OTTP Al Boesch – NPPD Terry Bilke – MISO R. Coish – MH Dennis Florom – LES K. Goldsmith – Alliant Todd Gosnell – OPPD W. Guttormson – SaskPwr Jim Maenner – WPS Tom Mielnik – MidAmerican Darrick Moe – WAPA Joe Knight – MRO	✓		Version 0 (BAL-003-0 — Frequency Response and Bias) or its successor is a logical place. Depending on the outcome of the V1 Balance Resource and Demand standard, it could reside there.
Response: : The Balance Resources and Demand standard drafting team has a successor version of Frequency Bias posted for review. The Resources Subcommittee Frequency Task Force is working with the Balance Resources and Demand standard drafting team to ensure that the efforts of both teams are coordinated.			
Southern Company Transmission, Operations, Planning and EMS Divisions (1) Marc Butts Steve Corbin Jim Viikinsalo Jim Griffith Doug McLaughlin Monroe Landrum	✓		The Frequency Response Standard could be included as part of the Balance Resources and Demand Standard. **Comments** Since both the Frequency Response Standard and the Balance Resources and Demand Standard address frequency, they obviously must work together closely. If they are crafted, as originally intended by the Frequency Taskforce, to utilize the same CPS database, there may be savings in administrative overhead in putting them both in the same standard.
Response: The intent is for the Frequency Response Standard to complement the Balance Resources and Demand standards. The Resources Subcommittee Frequency Task Force is working with the Balance Resources and Demand standard drafting team to ensure that the efforts of both teams are coordinated. The 'new' Balance Resources and Demand standards are close to completion and cover related but different topics from those in the proposed Frequency Response SAR. There doesn't seem to be any benefit in stalling the implementation of the new Balance Resources and Demand standards while the technical details of the new Frequency Response standard are developed, tested and then implemented.			
ATC (1) Peter Burke	✓		II.B.S1M5, Test results of speed/load governor controls.

Commenter	Yes	No	Comment
			Comments It may be appropriate to include this standard in the Phase III/IV standards that address speed/load governor controls (II.B.S1M5, Test results of speed/load governor controls). The three following customer demand related standards would be helpful in defining load response to frequency excursions: II.E.S1.M1, Plans for the evaluation and reporting of voltage & Frequency characteristics of customer demands. IIE.S1.M2 Documentation or requirements for determining dynamic characteristics of customer demands. II.E.S1.M3, Customer (dynamic) demand data.
Response: The drafting team will follow the development of the Phase III/IV planning standards under development (MOD-13 and MOD-27) that deal with governors and frequency response to be sure there are no conflicts. The Resources Subcommittee Frequency Task Force believes that a Frequency Response standard could simplify what is proposed in the planning standards if it allowed an on-line calculation of generator response.			
NERC Frequency Task Force Raymond L. Vice, Chairman	✓		The Frequency Response Standard could be included as part of the Balance Resources and Demand Standard. **Comments** Since both the Frequency Response Standard and the Balance Resources and Demand Standard address frequency, they obviously must work together closely. If they are crafted, as originally intended by the Frequency Taskforce, to utilize the same CPS database, there may be savings in administrative overhead in putting them both in the same standard.
Response: The Resources Subcommittee Frequency Task Force's intent is for the Frequency Response Standard to complement the Balance Resources and Demand standards. The 'new' Balance Resources and Demand standards are close to completion and cover related but different topics from those in the proposed Frequency Response SAR. There doesn't seem to be any benefit in stalling the implementation of the new Balance Resources and Demand standards while the technical details of the new Frequency Response standard are developed, tested and then implemented.			
SPP Operating Reliability Working Group Robert Rhodes –SPP (2) Ron Ciesiel – SPP (2) Bob Cochran – SPS (1) Mike Gammon – KCPL (1) Steve Hillman – WPEK (1) Allen Klassen – Westar (1)	✓		We would recommend that this standard be incorporated into the Balance Resource and Demand Standard (Standard 300) or the Version 0 BAL Standard.

Commenter	Yes	No	Comment
Bill Nolte – SECI (1) Mike Stafford – GRDA (1)			
Response: The Resources Subcommittee Frequency Task Force's intent is for the Frequency Response Standard to complement the Balance Resources and Demand standards. The 'new' Balance Resources and Demand standards are close to completion and cover related but different topics from those in the proposed Frequency Response SAR. There doesn't seem to be any benefit in stalling the implementation of the new Balance Resources and Demand standards while the technical details of the new Frequency Response standard are developed, tested and then implemented.			
Southern Co. Generation (6) Roman Carter Tony Reed Joel Dison Lucius Burris Lloyd Barnes Clifford Shepard Terry Crawley Roger Green Tom Higgins	✓		The Frequency Response Standard could be included as part of the Balance Resources and Demand Standard. **Comments** Since both the Frequency Response Standard and the Balance Resources and Demand Standard address frequency, they obviously must work together closely. If they are crafted, as originally intended by the Frequency Taskforce, to utilize the same CPS database, there may be savings in administrative overhead in putting them both in the same standard.
Response: The Resources Subcommittee Frequency Task Force's intent is for the Frequency Response Standard to complement the Balance Resources and Demand standards. The 'new' Balance Resources and Demand standards are close to completion and cover related but different topics from those in the proposed Frequency Response SAR. There doesn't seem to be any benefit in stalling the implementation of the new Balance Resources and Demand standards while the technical details of the new Frequency Response standard are developed, tested and then implemented.			
MISO Terry Bilke	✓		It's not a major issue. It appears it should be include in the Version 0 (BAL-003-0 — Frequency Response and Bias).
Response: The Resources Subcommittee Frequency Task Force's intent is for the Frequency Response Standard to complement the Balance Resources and Demand standards. The 'new' Balance Resources and Demand standards are close to completion and cover related but different topics from those in the proposed Frequency Response SAR. There doesn't seem to be any benefit in stalling the implementation of the new Balance Resources and Demand standards while the technical details of the new Frequency Response standard are developed, tested and then implemented.			
Dick Schulz Chair, IEEE Task Force on Large Interconnected Power System Response to Generation Governing			No comment.
TXU Energy Delivery Roy Boyer			No opinion.

4. Do you have any additional comments regarding the SAR that you believe should be addressed?

Commenter	Yes	No	Comment
MAAC Staff (2) Al DiCaprio – MAAC (2) Joe Willson – MAAC (2) Mark Kuras – MAAC (2)	✓		The SAR requestor has not provided any indication of a reliability problem. Decreasing frequency response is in and of itself not a reliability problem - more evidence is required as to the magnitude of the threat. Any standard that is proposed, regarding frequency response, should consider both generator and load response. If Load response does provide a significant portion of the frequency response (as some people contend) then that resource must be considered in the proposal. In short the standard must make clear whether it is for interconnection response or for balancing area response or for individual generator response and individual load response.
Response: Most commenters indicated that they feel that there is a reliability-related need for a standard to address Frequency Response. The standard is not intended to establish a large set of arbitrary requirements, but will establish the framework to collect the information to make informed engineering decisions. Additional detail has been added to the SAR's Purpose/Industry Need and the Detailed Description. The revised SAR does not specifically consider load response but does state that the proposed standard will include requirements for the Interconnection response, for the installation of governors and for BAs to operate their automatic generation control function on tie-line frequency bias and for BAs to respond to requests for information on frequency response. The revised SAR does not include requirements for generators to provide response and does not address load response.			
BPA Bart McManus Brian Tuck James Randall Francis Halpin Bill Mittlestat James Murphy	✓		Frequency response requirements are likely different for each of the three interconnected regions and a generalized approach will likely not meet WECC needs. The danger here is that a NERC-wide approach may not be compatible with the needs of a regional approach. Standards are currently being developed within WECC to address the frequency response concerns of this interconnection. We feel that if the Eastern Interconnection needs a Frequency Response Standard, they should utilize the NERC Frequency Response Standard Whitepaper to draft an Eastern Interconnection-specific Frequency Response Standard.
Response: The Resources Subcommittee Frequency Task Force agrees that frequency response is primarily an Interconnection issue and the proposed standard accommodates Interconnection differences both in amounts of response and methodology in calculating response. As noted in and earlier response, we would expect some general technical and engineering principles that should be met in order to calculate and evaluate the amount and distribution of frequency response. Additional SAR Detailed Description details have been added. The drafting team believes that stakeholders would prefer the assurance of knowing that NERC is providing oversight to ensure that all Interconnections have a technically sound basis for the development of respective frequency response requirements.			
Manitoba Hydro (1, 3, 5, 6) Gerald Rheault	✓		Below are a few general comments on the SAR: There is general agreement with the statement "reliance on load as the sole support to arrest the frequency can lead to a decline in the reliability of the grid" in paragraph 3, page 4 of the white paper. However enough information is not provided to

Commenter	Yes	No	Comment
			substantiate statements earlier in the paragraph such as, "the turn around in frequency from points C to B attributable to unit governor response has markedly declined and at times is non-existent in the eastern interconnection" and "the line from points C to D is shifting down and becoming horizontal". In areas where governor response is limited it may be necessary to explore the necessity of earmarking "high-set" blocks of load , as is practiced in ERCOT, to act as a supplementary to governor response. Although it is anticipated that this approach would probably be much more difficult and challenging to co-ordinate in larger areas. There should be careful thought put into the system/interconnection performance targets for frequency response. Perhaps the bar should be higher than preventing UFLS for credible generation loss events, i.e., provide a margin above this level. At the same time the standard should not impose unreasonable costs on entities to demonstrate compliance. The performance target should address both total interconnection response and also area or system response (potential islanding) and be very clear how generator operators (or load) obligations are allocated to achieve the performance targets. NERC should investigate a process to monitor interconnection frequency response to be able to measure performance.
Response: As envisioned, the standard will accommodate special needs of each Interconnection. It will not preclude load from being part of the solution. While not part of the standard, the Resources Subcommittee is pursuing the addition of functionality in the "NERC ACE-Frequency monitoring application" that will identify generator trips and automate the calculation of Interconnection frequency response. Evidence to date indicates that frequency response declines significantly during light load periods, even though the exact mechanism for this is not well defined. Most of the major frequency excursions experienced in the Eastern Interconnection have occurred during the shoulder period of the year during either the early morning or late evening periods.			
NPCC CP9, Reliability Standards Working Group Guy V. Zito – NPCC (2) Ralph Rufrano – NYPA (1) K. Goodman – ISONE (2) Al Adamson – NYSRC (2) Bob Pelligrini – UI (1) D. Kiguel – Hydro One (1) P. Lebro – Nat'l Grid (1) R. Champagne – TE (1) B. Hogue – NPCC (2) K. Khan – IESO (2) M. Potishnak – ISONE	✓		CHANGE This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to system these events. TO This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to these system events.

Commenter	Yes	No	Comment
(2) G. Campoli – NYISO (2)			
Response: The SAR has been revised and no longer includes this phrase.			
Energy Mark, Inc. (8) Howard Illian	✓		NERC has the responsibility of maintaining reliability on the North American Interconnections. NERC cannot perform that function effectively if it waits for reliability problems to become apparent in system operations before it takes actions to address those problems. NERC must be a forward looking organization that anticipates future reliability problems and takes actions to resolve those problems before they affect interconnection reliability.
Response: The Resources Subcommittee Frequency Task Force agrees with the comments and has made substantial changes to the SAR's Purpose/Industry Needs and the Detailed Description reflecting the industry comments.			
Calpine (6) James Stanton	✓		Given the language in the accompanying White Paper: The standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met).There must be a means for sale/purchase of frequency response as for any other quantity. – I believe this Standard should be developed in conjunction with NAESB. The definition, attributes and procurement metrics of the frequency response product will be a critical component of this Standard. Some guidance in defining and developing this service to the bulk interconnected system can be found in the NERC IOS Reference Document. The Standard should build on this previous IOS work.
Response: The Resources Subcommittee Frequency Task Force intent for this proposed standard does not preclude market solutions. Language in the original SAR that referenced markets has been removed and is not in the revised SAR. We hope that the previous IOS work and the related MOD standards will provide balancing authorities a means to obtain frequency response where needed. It is quite possible that NAESB will pick up where the IOS left off.			
MAAC (2) John Horakh	✓		It appears Frequency Response is an accepted term used for this requirement, and therefore might be difficult to change. However, Frequency Response is not a very good description of the requirement. A term such as Transient Generator and Load Response would be more descriptive.
Response: Transient Generator and Load Response probably is a more descriptive than Frequency Response. Note that the focus of the proposed standard would be on generator response, not on load response. . The Resources Subcommittee Frequency Task Force agrees that changing the name from Frequency Response would likely encounter resistance.			
ISO/RTO Standards Review Committee (2) K. Tammar – NYISO (2) D. McMaster – AESO (2) Ed Riley – CAISO (2) Sam Jones – ERCOT (2) P. Henderson – IESO (2)	✓		We appreciate the opportunity to comment and believe there is a need for such a standard. It needs to be recognized that there are two objectives for governor response, namely, to provide response on an interconnection wide basis to maintain an acceptable frequency and secondly to control frequency in island situations. The former may allow for averaging over an area of the response

Commenter	Yes	No	Comment
P. Brandien – ISO-NE (2) B. Phillips – MISO (2) B. Balmat – PJM (2) C. Yeung – SPP (2)			requirement but the latter may limit the extent of averaging. Published studies show frequency response is declining when it should be increasing with load. The main concerns with this decreasing performance are: There may be areas unable to withstand severe disturbances. Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors. Because engineering models use theoretical frequency response, they are likely over optimistic and may misstate grid stability limits. This standard would allow the industry to determine whether the decline is local or global. Rather than implementing a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either: Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data). Embed the calculation in the NERC ACE-monitoring application. Refer to our earlier comments the structure of the standard (where lower amounts of BA response trigger an internal assessment rather than automatic assignment of non-compliance). BAs (and ultimately generators) would only be initially non-compliant if their response was low AND the BA failed to perform a reliability assessment in conjunction with its TOP. Non compliance should be assessed if the BA does not alleviate the deficiency within a reasonable timeframe. This default assessment would be at the BA level, but could be on an area basis (likely islanding area or where a TSP has responsibility for frequency responsive and black start ancillary services). The standard should employ a methodology that not only captures initial response (first few seconds after the event) but also the sustained response until AGC action takes over Each Interconnection should have the ability to add and further define the standard to meet its needs.

Commenter	Yes	No	Comment
			Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. A envisioned, the standard will measure response for perhaps a minute to ensure response is not withdrawn immediately after it is provided. The proposed standard would not mandate a given amount of response, but would requires an analysis if response were measurably below the norm. The proposed standard would accommodate the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee has a tool that could calculate the BA's performance to the standard. The drafting team agrees that performance requirements must be validated by the industry. As you suggested, a long field test may be needed before justifiable minimum performance standards can be identified.			
MRO (2) Larry Larson – OTTP Al Boesch – NPPD Terry Bilke – MISO R. Coish – MH Dennis Florom – LES K. Goldsmith – Alliant Todd Gosnell – OPPD W. Guttormson – SaskPwr Jim Maenner – WPS Tom Mielnik – MidAmerican Darrick Moe – WAPA Joe Knight – MRO	✓		We appreciate the opportunity to comment and believe there is a need for such a standard. Published studies show frequency response is declining when it should be increasing with load. Because there is no process in place to track BA or Interconnection response, we don't know whether the decline is local or global. Primary concerns with this decreasing performance in primary control: 1. There may be areas unable to withstand severe disturbances. 2. Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors. 3. Because engineering models use theoretical frequency response, they are likely overoptimistic and may misstate grid stability limits. Rather than putting in a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either: • Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data). • Embed the calculation in the NERC ACE-monitoring application. The standard will need to acknowledge the large variability in individual responses at each BA due to coincident load changes and amount and mix of generation. In addition, smaller Interconnections likely need greater response. Refer to our earlier comments the structure of the standard

Commenter	Yes	No	Comment
			(where lower amounts of response trigger an internal assessment rather than assessment non-compliance). BAs (and ultimately generators) would only be initially non-compliant if their response was low AND they failed to perform the reliability assessment. Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified. The standard should not preclude market solutions to providing frequency response, but such arrangements would need to be looked at closely to be sure they fulfill reliability needs.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. As envisioned, the proposed standard would not mandate a given amount of response, but would require an analysis if response were measurably below the norm. The proposed standard would accommodate the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee has a tool that could calculate the BA's performance to the standard. The Resources Subcommittee Frequency Task Force acknowledges the variability inherent in measuring frequency response. The standard will require capturing sufficient samples to make an objective measurement. The proposed standard does not preclude market solutions. The new requirements may need to be field tested for a long duration before compliance with the requirements is mandatory. As envisioned, the standard does not mandate a specific amount of response, but requires analysis if response is markedly below the norm. Analysis may identify the need for corrective measures and the standard will accommodate the necessary time to make corrections. The references to market solutions that were contained in the original SAR have been removed. NAESB may choose to develop associated business practices.			
NCPA (4) Les Pereira	✓		Two statements are made in the SAR: 1. The purpose of the proposed SAR is to ensure that frequency of the Interconnection remains above underfrequency load shedding setpoints during the transient period following the sudden loss of generation on the Interconnection. 2. Furthermore, it is stated that " In regard to frequency response, one shortcoming of the recommendations in policy today is that there is no guidance regarding how much governor response (in MW) is required at the 5% droop rate." The first is a calculated number and depends not only on the amount of generation tripped, but also the total generation in the Whole Interconnection at the time of trip. Obviously two very different answers will be obtained : one with the Interconnection intact (normal operation) and the second when islanded. Both affect reliability. The second issue has been thoroughly investigated in the WECC and a new Thermal Governor modeling approach has

Commenter	Yes	No	Comment
			been implemented in the WECC after system tests, an exhaustive modeling validation effort and obtaining data from the generator owners. This has been documented in two IEEE Transaction papers described below. These papers present the development of a new turbine-governor modeling approach in WECC that correctly represents thermal units that have demonstrated unresponsive characteristics such as "base loaded" units operated with limiters, or partially responsive units with MW-load-controllers. The May 18th 2001 system trip test for 1250 MW performed with all AGCs off indicated that only about 40% of the governors effectively responded in the real system. If all the governors were responsive the calculated generation pickup for governors with a 5% droop for a 0.1 Hz frequency deviation would be 3185 MW instead of 1250 MW. The new modeling approach has been extensively validated against recordings from three WECC system tests and several large disturbances, and has been approved for use in all operation and planning studies in the WECC. The second paper describes the steps being taken to obtain validated data for the new governor models. The work done by WECC indicate clearly that we do not get the required 5% droop from all units as required by NERC. The modeling approach taken was to model the governors in planning and operating studies exactly as they are being actually operated. Enforcement/compliance of the 5% droop is a separate issue and must be addressed by operating policies. Obviously, the SAR touches upon only part of the problem, but it is a good start and should be expanded. It also needs to be cross-referenced with other areas such as the 5% droop requirement, an effective spinning reserves policy that actually works (see the papers), and the effect on 'governor' powerflow and voltage stability analysis as a result of "unresponsive" governors. The white paper referred by the SAR only touches upon the WECC effort and seems to miss the whole point of the modeling and validation work by the Governor Modeling Task Force in WECC - and what we have achieved in WECC to address realistic modeling of unresponsive governors in the real system. 1. "A New Thermal Governor Modeling Approach in the WECC" by L. Pereira, J. Undrill, D. Kosterev, D. Davies, S. Patterson, *IEEE Trans. Power Systems*, vol. 18, Issue.2, pp. 819-829, May 2003. (*IEEE 2004 prize paper). Presented at Toronto IEEE PES, July 2003.* 2. "New Thermal Governor Model Selection and Validation in the WECC" by Les Pereira, Dmitry

Commenter	Yes	No	Comment
			Kosterev, Donald Davies, and Shawn Patterson - IEEE TPWRS – Vol.19, No.1, pp 517-523, February 2004. *Presented at Denver IEEE PES, July 2004.*
Response: The Resources Subcommittee Frequency Task Force appreciates the significant work that has been done in this area by the WECC and has referenced some of this research in the Whitepaper. We believe the Planning Standards under development (MOD-13 and MOD-27) deal with the detailed governor issues that you have outlined. The Resources Subcommittee Frequency Task Force appreciates the importance of the modeling effort you mention. This standard is not intended to address the modeling issues, but provides the framework and data needed to support the modeling. The SAR was modified to include basic governor requirements.			
FRCC (2) Linda Campbell Ron Donahey – TEC (1) Mark Bennett – GRU (3) Steve Wallace – SEC (5) S. McElhaney – FMPA (5) Ted Hobson – JEA (1)	✓		At this time the FRCC has the highest frequency settings for load shedding in the Eastern Interconnection (southern part of the Region). Being a peninsula and out of necessity, the Region has developed a well coordinated, under-frequency program for extreme frequency excursions. Ambiguity of the requirements, uncertainty of measurement and the lack of benefit to the Region require that the FRCC to oppose this Standard Authorization Request at this time.
Response: The interconnection measure of response is intended as a benchmark and as a validation of BAs' reported performance.			
Southern Company Transmission, Operations, Planning and EMS Divisions (1) Marc Butts Steve Corbin Jim Viikinsalo Jim Griffith Doug McLaughlin Monroe Landrum	✓		We believe that the industry will be exposing the interconnected electrical systems of North America to a significant degree of reliability risk if a Frequency Response Standard similar to the one proposed by this SAR is not adopted. This risk can be mitigated somewhat by the turbine governor requirements of Standard MOD-014-1 from the Phase III/IV Standards SAR, if passed. However, the risk can be managed properly (and in the most economical manner) only on an interconnection/balancing authority basis, not on an individual generator basis as required by Standard MOD-014-1. *What is important is that the interconnections maintain sufficient frequency responsive resources to ensure the stability of interconnection frequency under first contingency conditions. The Frequency Response Standard, as proposed, sets requirements for the management and deployment of frequency responsive resources that achieve this goal without unduly interfering with the on going operation of the interconnection. We strongly urge the industry to support this SAR.*
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
New York ISO (2) Mike Calimano	✓		We appreciate the opportunity to comment and believe there is a need for such a standard. Published studies show frequency response is declining when it should be increasing with load. The main concerns with this decreasing performance are:

Commenter	Yes	No	Comment
			There may be areas unable to withstand severe disturbances. Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors. Because engineering models use theoretical frequency response, they are likely overoptimistic and may misstate grid stability limits. This standard would allow the industry to determine whether the decline is local or global. Rather than implementing a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either: Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data). Embed the calculation in the NERC ACE-monitoring application. Refer to our earlier comments the structure of the standard (where lower amounts of BA response trigger an internal assessment rather than automatic assignment of non-compliance). BAs (and ultimately generators) would only be initially non-compliant if their response was low AND the BA failed to perform a reliability assessment in conjunction with its TOP. This default assessment would be at the BA level, but could be on an area basis (likely islanding area or where a TSP has responsibility for frequency responsive and black start ancillary services). The standard should employ a methodology that not only captures initial response (first few seconds after the event) but also the sustained response until AGC action takes over Each Interconnection should have the ability to add and further define the standard to meet its needs. Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified.

Commenter	Yes	No	Comment
			CHANGE This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to system these events. TO This SAR is proposed to develop a standard to measure sub-minute responses to changes in frequency and to set minimum acceptable responses to these system events.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments as a whole. The proposed standard does not mandate a given amount of response, but requires an analysis if response is measurably below the norm. The proposed standard accommodates the simplification ideas you propose, and in fact, if data is saved in a common format, the Resources Subcommittee has a tool that will calculate the BA's performance to the standard. The Resources Subcommittee Frequency Task Force has added to the Detailed Description requirements that all balancing authorities shall operate their AGC function on tie-line frequency bias and that all balancing authorities shall perform frequency response characteristics surveys when called for by NERC. The Resources Subcommittee Frequency Task Force agrees with the sub-minute responses comment and has made the change. The new requirements may need to be field tested for a long duration before compliance with the requirements is mandatory. A long field test with extensive data collection may be needed before justifiable minimum performance standards can be identified. The references to market solutions that were contained in the original SAR have been removed. NAESB may choose to develop associated business practices. As envisioned, the standard will measure the response for up to 60 seconds to ensure initial response is not withdrawn. The standard will also provide interconnection flexibility. The phrase noted (starting with , 'This SAR. . . ') was removed from the revised SAR.			
IESO (2) Pete Henderson	✓		We appreciate the opportunity to comment and believe there is a need for such a standard. It needs to be recognized that there are two objectives for governor response, namely, to provide response on an interconnection wide basis to maintain an acceptable frequency and secondly to control frequency in island situations. The former may allow for averaging over an area of the response requirement but the latter may limit the extent of averaging. Published studies show frequency response is declining when it should be increasing with load. The main concerns with this decreasing performance are: There may be areas unable to withstand severe disturbances. Following a grid separation or collapse, control areas may be unable to fulfill their blackstart and restoration responsibilities, thereby becoming a burden to neighbors. Because engineering models use theoretical frequency response, they are likely over optimistic and may misstate grid stability limits.

Commenter	Yes	No	Comment
			This standard would allow the industry to determine whether the decline is local or global. Rather than implementing a complicated infrastructure or process, we would suggest that NERC automate the calculation of frequency response by either: Asking BAs to save their CPS-source data in a common format so a common tool can be used (MAPP BAs and some others use a common tool that can calculate frequency response with CPS-source data). Embed the calculation in the NERC ACE-monitoring application. The standard should employ a methodology that not only captures initial response (first few seconds after the event) but also the sustained response until AGC action takes over Providing visibility on where and when performance is substandard will likely initiate sufficient action to arrest the decline in performance. Minimum performance standards could be implemented after the industry has identified what is reasonably achievable and technically justified.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments. We agree that smaller areas need greater response, and this concept will be applied in establishing the initial target responses for the interconnections (the historic response will bear this out). Under the ERO, interconnections can also establish stricter targets. The new requirements may need to be field tested for a long duration before compliance with the requirements is mandatory. A long field test with extensive data collection may be needed before justifiable minimum performance standards can be identified. As envisioned, the standard will measure the response for up to 60 seconds to ensure initial response is not withdrawn. The references to market solutions that were contained in the original SAR have been removed. NAESB may choose to develop associated business practices.			
NERC Frequency Task Force Raymond L. Vice, Chairman	✓		I personally believe that the industry will be exposing the interconnected electrical systems of North America to a significant degree of reliability risk if a Frequency Response Standard similar to the one proposed by this SAR is not adopted. This risk can be mitigated somewhat by the turbine governor requirements of Standard MOD-014-1 from the Phase III/IV Standards SAR, if passed. However, the risk can be managed properly (and in the most economical manner) only on an interconnection/balancing authority basis, not on an individual generator basis as required by Standard MOD-014-1. What is important is that the interconnections maintain sufficient frequency responsive resources to ensure the stability of

Commenter	Yes	No	Comment
			interconnection frequency under first contingency conditions. The Frequency Response Standard, as proposed, sets requirements for the management and deployment of frequency responsive resources that achieve this goal without unduly interfering with the on going operation of the interconnection. I strongly urge the industry to support this SAR.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
Dick Schulz Chair, IEEE Task Force on Large Interconnected Power System Response to Generation Governing			First, I make these comments based on work that I've done principally at American Electric Power Service Corp, before my retirement from there in November 2000, and as founding Chair of the IEEE Task Force on Large Interconnected Power System Response to Generation Governing. These comments are entirely mine, and reflect no views of either body. Second. It appears that the final standard will differ from any single person's opinions. Thus the specific comments below may not prevail. Specific Comment 1: The comment on page 4 of the SAR, "The standard should not preclude market solutions (e.g. allow purchasing of response as long as deliverability and restoration criteria can be met).There must be a means for sale/purchase of frequency response as for any other quantity." is workable only in near-normal operating conditions. But it will fail miserably when there is any islanding condition. An analogy: Several skydivers agree that reserve parachutes are a very good idea, but don't want to invest in 1 reserve each. So they agree that they'll buy one to share among them, so each will be saved by that spare. This means that they will hold hands until they pull their ripcords. Sounded good, until they tried it, and the first guy to pull his cord came unhitched, had a failed main 'chute, and the spare was on someone else. Specific Comment 2: The comment on page 4 of the SAR, "The measurement selected must be accurate and, to the extent practical, easy to implement.' may be met in the Eastern Interconnection by the underway DOE "Eastern Interconnection Phasor Project ' and by the similar WECC measurement systems, commonly called "WAMS". Les Peieira's paper, cited in the White Paper, used the WAMS measurements.
Response: The Resources Subcommittee Frequency Task Force appreciates the comments. The proposed standard does not preclude market solutions. The SAR's intent is to define the proposed standard's scope, the actual detail that you recommend will be developed during the standard drafting phase. The phasor projects in both the Eastern and Western Interconnections may indeed be a source of accurate and time stamped frequency data for this standard's application.			

Commenter	Yes	No	Comment
Southern Co. Generation (6) Roman Carter Tony Reed Joel Dison Lucius Burris Lloyd Barnes Clifford Shepard Terry Crawley Roger Green Tom Higgins	✓		It is believed that the industry will be exposing the interconnected electrical systems of North America to a significant degree of reliability risk if a Frequency Response Standard similar to the one proposed by this SAR is not adopted. This risk can be mitigated somewhat by the turbine governor requirements of Standard MOD-014-1 from the Phase III/IV Standards SAR, if passed. However, the risk can be managed properly (and in the most economical manner) on an interconnection/Balancing Authority basis, not on an individual generator basis as required by Standard MOD-014-1. The governor response in MW for generators is not just dependent on the governor droop and dead-band settings, but on the design of the plant control system (sliding pressure boiler, nuclear pressurized water reactor, etc.). For example, nuclear plant operators must control reactivity changes in the core and generally cannot allow external controls to increase or decrease power levels on demand. This standard should take such factors into account and address frequency & MW response at the Balancing Authority level, not at the individual generator level**.** What is important is that the interconnections maintain sufficient frequency responsive resources to ensure the stability of interconnection frequency under first contingency conditions. The Frequency Response Standard, as proposed, sets requirements for the management and deployment of frequency responsive resources that achieve this goal without unduly interfering with the on going operation of the interconnection. We support this SAR.
Response: The Resources Subcommittee Frequency Task Force appreciates and supports your comments. As envisioned, the standard will measure response at the Interconnection and Balancing Authority level. Only when a Balancing Authority's response measurably below the norm is additional analysis involved.			
MISO Terry Bilke	✓		Thanks for the opportunity to comment. I hope the SAC puts all comments in perspective. We are in a period where the industry is reluctant to adopt new standards that generate extra work and compliance exposure. The reliability of the Interconnections can benefit with minimal impact to most BAs with a light-handed standard. Rather than implementing a complicated process, why not embed most of the effort in the NERC ACE-monitoring application? Only those BAs with unusually low response would need to drill down and do an internal assessment to determine their ability to withstand disturbances and whether they have responsive resources for blackstart. Knowing where and when performance is substandard will likely arrest the decline in performance. Minimum performance standards could be implemented once the industry has identified

Commenter	Yes	No	Comment
			what is reasonably achievable and technically justified.
Response: The Resources Subcommittee Frequency Task Force agrees with these comments.			
New York State Reliability Council (2) Theodore Pappas	✓		The Standard should define the term "event" in terms of time and frequency deviation. The frequency deviation the event must fall outside the droop deadband.
Response: Response: The Resources Subcommittee Frequency Task Force agrees that there should be clear criteria set for identifying events that will be used in calculating frequency response. The SAR was revised to indicate that the standard will require governors to provide droop characteristics within a specified range (to be determined during standard drafting). At this point, the Resources Subcommittee Frequency Task Force recommends each interconnection set a target excursion size that is used for selection of samples and recommends that the target be at least equal to the traditional 36 mHz deadband.			
CAISO (2) Ed Riley Yuri Makarov Steve McCoy		✓	
TXU Electric Delivery (1) Travis Besier or Ellis Rankin		✓	
Progress Energy – Carolinas (1, 3, 5, 6) Phil Creech		✓	
TXU Energy Delivery Roy Boyer		✓	
Robert Blohm		✓	
SPP Operating Reliability Working Group Robert Rhodes –SPP (2) Ron Ciesiel – SPP (2) Bob Cochran – SPS (1) Mike Gammon – KCPL (1) Steve Hillman – WPEK (1) Allen Klassen – Westar (1) Bill Nolte – SECI (1) Mike Stafford – GRDA (1)		✓	
ATC (1) Peter Burke		✓	
Southern Company Transmission, Operations, Planning and			

Commenter	Yes	No	Comment
EMS Divisions (1) Marc Butts Steve Corbin Jim Viikinsalo Jim Griffith Doug McLaughlin Monroe Landrum			
TVA (1) Kathie Davis Larry Akens Mitch Needham Chuck Feagans Ed Forsythe		✓	
Alliant Energy (1) Kenneth A. Goldsmith		✓	
We Energies (3, 4, 5) Howard Rulf		✓	