Demande d'informations additionnelles de la Régie de l'énergie

DEMANDE D'INFORMATION ADDITIONNELLE DE LA RÉGIE DE L'ÉNERGIE (LA RÉGIE) À HYDRO-QUÉBEC DANS SES FONCTIONS DE COORDONNATEUR DE LA FIABILITÉ AU QUÉBEC (LE COORDONNATEUR) - DEMANDE D'ADOPTION DE LA NORME DE FIABILITÉ PRC-006-NPCC-2 – DÉLESTAGE EN SOUS-FRÉQUENCE AUTOMATIQUE

Norme PRC-006-NPCC-2

1. Référence : (i) Pièce B-0004 p. 6.

Préambule :

Hydro-Québec, par sa direction principale – Contrôle des mouvements d'énergie et exploitation du réseau d'Hydro-Québec dans ses activités de transport d'électricité (le Coordonnateur), a déposé, le 18 août 2020, une demande auprès de la Régie de l'énergie (la Régie) visant l'adoption de la norme régionale du Northeast Power Coordinating Council (NPCC) PRC-006-NPCC-2 et de son annexe Québec, dans ses versions française et anglaise (la Demande).

La norme PRC-006-NPCC-2 a été adoptée par la North American Electric Reliability Corporation (la NERC) le 5 novembre 2019 et approuvée par la Federal Energy Regulatory Commission (la FERC) le 18 février 2020. Elle établit, pour le NPCC, des exigences de programme de délestage en sous-fréquence plus rigoureuses et plus spécifiques que celles de la norme PRC-006-3, qui est de portée continentale et en vigueur au Québec depuis le 1er octobre 2018.

Par souci d'efficacité dans le traitement de la Demande et avant d'entamer son examen sur le fond, la Régie sollicite certaines informations additionnelles (les Informations) du Coordonnateur, à savoir :

Demandes d'informations additionnelles :

1. Une liste détaillée des erreurs constatées par le Coordonnateur dans les références présentes dans la table du niveau de gravité de la non-conformité (VSL) (E4, E9 et E13, entre autres) ainsi qu'à l'annexe B[1] et dont le NPCC et la NERC ont été informés :

> « « *During NPCC's consultation with NERC Legal in this matter, NERC indicated that for minor stylistic changes, minor typos, grammatical issues such as punctuation, etc., NERC is now holding them until the next revision of the standard and does not initiate the Errata Process. The Errata Process is now specifically used for issues where clear errors such as incorrect references, decimal points in the wrong place in numbers, etc. could affect the requirements and adversely impact reliability. NERC Legal also indicated that FERC approved the standard PRC-006-NPCC-2 with an RD docket "letter order" which means no notice of proposed rulemaking ("NOPR") or further questions were raised by FERC prior to Commission approval. The standard's reliability requirements are very clear, augment the NERC Underfrequency Load Shedding ("UFLS") Continent-wide standard, add more stringent UFLS system and generator performance requirements, and furthermore will support retirement of NPCC's Directory 12, which will contribute to the efficiency of UFLS study processes in Québec and the NPCC Region. It is important that the standard, like any other, be considered and adopted by the Régie based on the reliability merits. NERC Legal also indicated the standard has been filed with the other Provincial Governmental Authorities.*
>
> *NPCC agrees the compliance related and stakeholder developed VSLs could be written more concisely. [...] Also, it is important to note that VSLs are only used when there is a violation of a standard's requirement to help determine penalty and are a compliance element, not a reliability related one. [...]*
>
> *In conclusion, NPCC encourages the consideration of the Régie de l'énergie to adopt the PRC-006-NPCC-2 "Automatic Underfrequency Load Shedding" based on the merits of its requirements and contribution to the reliability of Québec. NPCC will also archive the comments received by Hydro-Québec TransÉnergie regarding improvements for the next revision* »[2].[nous soulignons]

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1 HQCF-1-2 Présentation de la demande visant l'adoption de la norme de fiabilité PRC-006-NPCC-2, pièce B-0004 page 6 de 9, consulté en ligne le 30 septembre 2020, http://publicsde.regie-energie.qc.ca/projets/555/DocPrj/R-4131-2020-B-0004-Demande-Piece-2020_08_18.pdf#page=8

R1- Veuillez trouver ci-après les erreurs constatées par le Coordonnateur de la fiabilité dans la section C de la norme PRC-006-NPCC-2, paragraphe 1.2. Conservation des pièces justificatives, lesquelles sont surlignées en bleues dans les présentes. À l'annexe A de ce document, vous trouverez une copie des annotations soumises au NPCC.

> ***« Le distributeur et le propriétaire d'installation de transport doivent conserver les pièces justificatives pour les mesures M2, M3, M4, M5, M8 et M9 pendant trois années civiles.***
> ***Le coordonnateur de la planification doit conserver les pièces justificatives pour les mesures M1, M2, M5, M6 et M7 pendant trois années civiles.*** *»*

Dans le tableau Niveau de gravité de la non-conformité (VSL), lesquelles sont surlignées en bleues s :
«

E4.	Le *distributeur* ou le *propriétaire d'installation de transport* qui ne respecte pas les tolérances, le nombre de stades ou les consignes de fréquence du programme de DSF a rempli les obligations des alinéas 5.1 à 5.4 de l'exigence E5, mais a dépassé pour une période allant jusqu'à plus de 10 jours civils, mais d'au plus 20 jours civils, les limites de temps pour au moins un de ces quatre alinéas.	Le *distributeur* ou le *propriétaire d'installation de transport* qui ne respecte pas les tolérances, le nombre de stades ou les consignes de fréquence du programme de DSF a rempli les obligations des alinéas 5.1 à 5.4 de l'exigence E5, mais a dépassé de plus de 20 jours civils et d'au plus 30 jours civils les limites de temps pour au moins un de ces quatre alinéas.	Le *distributeur* ou le *propriétaire d'installation de transport* qui ne respecte pas les tolérances, le nombre de stades ou les consignes de fréquence du programme de DSF a rempli les obligations, mais a dépassé de plus de 30 jours civils et d'au plus 60 jours civils les limites de temps pour au moins un de ces quatre alinéas.	Le *distributeur* ou le *propriétaire d'installation de transport* qui ne respecte pas les tolérances, le nombre de stades ou les consignes de fréquence du programme de DSF n'a pas rempli les obligations de tous les alinéas de l'exigence E5 sans dépasser de 60 jours civils les limites de temps pour chacun de ces alinéas.

E9.	Le *distributeur* ou le *propriétaire d'installation de transport* a transmis à son *coordonnateur de la planification* des documents indiquant la *charge* nette réelle qui aurait été délestée par les relais de DSF à chaque stade du programme de DSF, selon l'exigence E11, plus de 15 mois civils, mais au plus 16 mois civils, après la dernière mise à jour.	Le *distributeur* ou le *propriétaire d'installation de transport* a transmis à son *coordonnateur de la planification* des documents indiquant la *charge* nette réelle qui aurait été délestée par les relais de DSF à chaque stade du programme de DSF, selon l'exigence E11, plus de 16 mois civils, mais au plus 17 mois civils, après la dernière mise à jour.	Le *distributeur* ou le *propriétaire d'installation de transport* a transmis à son *coordonnateur de la planification* des documents indiquant la *charge* nette réelle qui aurait été délestée par les relais de DSF à chaque stade du programme de DSF, selon l'exigence E11, plus de 17 mois civils, mais au plus 18 mois civils, après la dernière mise à jour.	Le *distributeur* ou le *propriétaire d'installation de transport* n'a pas transmis à son *coordonnateur de la planification* des documents indiquant la *charge* nette réelle qui aurait été délestée par les relais de DSF à chaque stade du programme de DSF, selon l'exigence E11, 18 mois civils après la dernière mise à jour.
E13.	Sans objet	Le *propriétaire d'installation de production* n'a pas communiqué au *coordonnateur de la planification* les réglages existants de la protection en sous-fréquence et toute modification qui leur est apportée, ainsi que la justification technique des réglages, conformément à l'alinéa 13.2 de l'exigence E13.	Le *propriétaire d'installation de production* n'a pas réglé la protection en sous-fréquence pour qu'elle se déclenche à une fréquence aussi basse que possible compte tenu de la conception des installations et des restrictions prévues dans les permis, conformément à l'alinéa 13.1 de l'exigence E13.	Le *coordonnateur de la planification* de l'Ontario, du Québec ou des provinces maritimes ou le *propriétaire d'installation de production* dans les zones de *coordonnateur de la planification* de l'ISO-NE et du NYISO n'a pas demandé que soit assuré un délestage compensateur conformément à l'alinéa 13.3 de l'exigence E13.

»

Dans l'annexe B, l'erreur suivante a été constatée laquelle est surlignée en bleue:

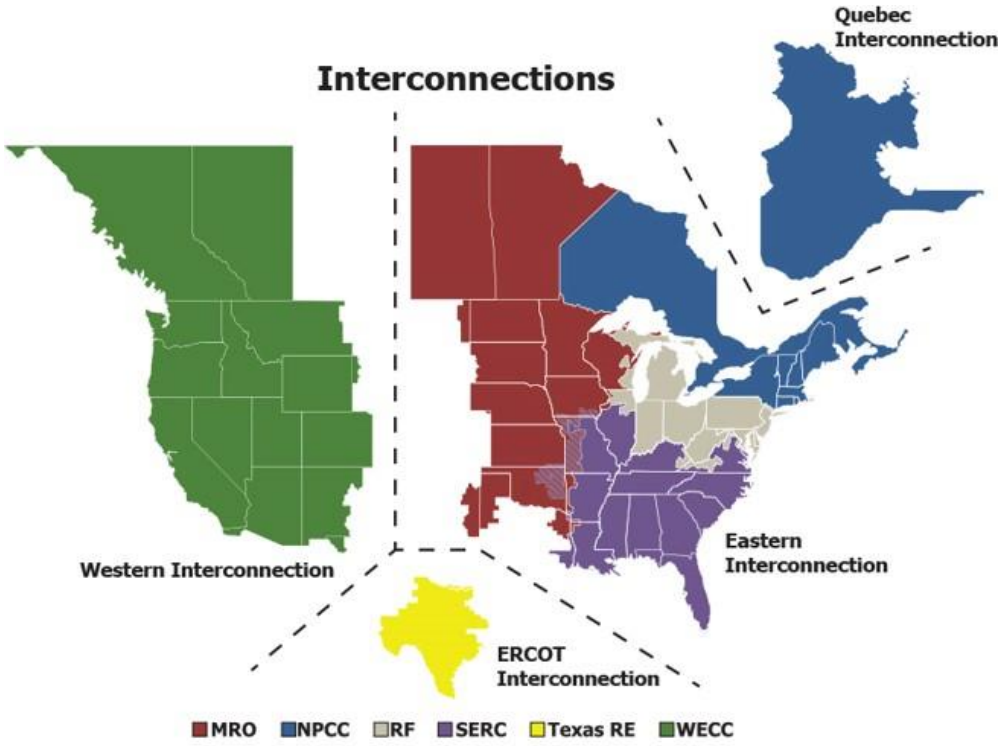
« 2.3 Le délestage compensateur assuré par le distributeur ou le propriétaire d'installation de transport s'ajoute à la charge que celui ci doit délester conformément à l'exigence E4 de la présente norme. »

2. Un tableau indiquant les exigences de la norme PRC-006-NPCC-2 applicables à l'Interconnexion de l'Est et celles applicables à l'Interconnexion du Québec, selon le format suivant :

R2 – Tel que mentionné aux pages 5 et 6 de la pièce B-0005[2] HQCF-1 document 2 – Informations relatives aux normes :

« Il est important de noter que la norme de fiabilité régionale PRC-006-NPCC-2 considère que l'Interconnexion du Québec est distincte de l'Interconne[x]ion de l'Est. Ainsi, les exigences qui font référence uniquement à l'Interconne[x]ion de l'Est ne sont pas applicables dans l'Interconnexion du Québec. ».

Dans le tableau suivant, les références à l'Interconnexion du Québec et l'Interconnexion de l'Est dans les exigences de la norme sont soulignées. Il est à noter que la norme s'applique seulement à la zone géographique du NPCC dans l'Interconnexion de l'Est tel que précisé à la figure ci-bas.



2 B-0005 HQCF-1 document 2 – Informations relatives aux normes, pages 5 et 6 de 7, consulté en ligne le 30 septembre 2020 http://publicsde.regie-energie.qc.ca/projets/555/DocPrj/R-4131-2020-B-0005-Demande-Piece-2020_08_18.pdf

Exigences	Applicable à l'Interconnexion de l'Est	Applicable à l'Interconnexion du Québec
E1. Chaque coordonnateur de la planification du NPCC dans l'Interconnexion de l'Est doit concevoir, pour ses îlots situés entièrement dans la région du NPCC, un programme de DSF dont les caractéristiques de fonctionnement permettent d'empêcher la fréquence de demeurer au dessous de 59,5 Hz pendant plus de 30 secondes, conformément à la figure 1	**X**	
E2. Chaque coordonnateur de la planification doit communiquer aux distributeurs, aux propriétaires d'installation de production et aux *propriétaires d'installation de transport*, dans les 30 jours civils suivant la réception d'une demande, le périmètre des îlots de DSF désignés selon la norme NERC PRC 006 de portée continentale relative au DSF	**X**	**X**
E3. Chaque distributeur et chaque propriétaire d'installation de transport du NPCC dans l'Interconnexion de l'Est doit mettre en œuvre un programme de DSF automatique qui reflète les conditions normales d'exploitation, à l'exclusion des indisponibilités. Le programme de DSF automatique doit être mis en œuvre îlot par îlot, pour chaque îlot désigné selon la norme PRC 006 de portée continentale de la NERC relative au DSF, selon les modalités suivantes […]	**X**	
E4. Chaque distributeur ou propriétaire d'installation de transport du NPCC dans l'Interconnexion de l'Est qui ne respecte pas les paramètres de programme de DSF prescrits aux tableaux 1 à 3 de l'annexe C, et chaque distributeur ou propriétaire d'installation de transport dans l'Interconnexion du Québec qui ne respecte pas les paramètres de programme de DSF spécifiés par son coordonnateur de la planification, doit : […]	**X**	**X**

Exigences	Applicable à l'Interconnexion de l'Est	Applicable à l'Interconnexion du Québec
E5. Chaque coordonnateur de la planification doit établir, et réexaminer au moins une fois toutes les cinq années civiles, les seuils de blocage (notamment la tension, le courant et le délai) qui doivent être utilisés dans le programme de DSF de sa région.	**X**	**X**
E6. Chaque coordonnateur de la planification doit transmettre à chaque propriétaire d'installation de transport et à chaque distributeur dans sa zone de coordonnateur de la planification les seuils de blocage applicables dans les 30 jours civils suivant tout changement.	**X**	**X**
E7. Chaque distributeur et chaque propriétaire d'installation de transport qui reçoit une notification selon l'exigence E6 doit établir et soumettre un plan de mise en œuvre relatif aux seuils de blocage, pour approbation par le coordonnateur de la planification, dans les 90 jours civils suivant la demande du coordonnateur de la planification.	**X**	**X**
E8. Chaque distributeur et chaque propriétaire d'installation de transport doit mettre en place les seuils de blocage transmis par son coordonnateur de la planification selon l'exigence E6, conformément au plan de mise en œuvre approuvé par le coordonnateur de la planification selon l'exigence E7.	**X**	**X**

Exigences	Applicable à l'Interconnexion de l'Est	Applicable à l'Interconnexion du Québec
E9. Chaque distributeur et chaque propriétaire d'installation de transport doit, tous les ans (mais sans dépasser 15 mois entre les mises à jour), transmettre à son coordonnateur de la planification des documents indiquant la charge nette réelle qui aurait été délestée par les relais de DSF à chaque stade du programme de DSF. La charge nette réelle doit correspondre à la charge nette intégrée de la pointe horaire de l'entité pour l'année précédente, cette valeur étant déterminée par mesure ou par calcul de la charge passant par les interrupteurs dont les relais de DSF commanderaient l'ouverture. En l'absence de données de mesure, on peut utiliser des données obtenues par calcul.	**X**	**X**
E10. Chaque propriétaire d'installation de production doit régler chaque relais de déclenchement en sous-fréquence de groupe de production, si un tel relais existe, à une valeur égale ou inférieure à la courbe appropriée de déclenchement des groupes de production de la figure 2, sauf si les exigences E13 ou E16 l'en exemptent.	**X**	**X**
E11. Chaque propriétaire d'installation de production doit communiquer les réglages de déclenchement en sous-fréquence des groupes de production et leur temporisation dans un délai de 45 jours civils après en avoir reçu la demande de son coordonnateur de la planification.	**X**	**X**
E12. Chaque propriétaire d'installation de production ayant un nouveau groupe de production, ou encore un groupe existant dont la capacité nette a été accrue de plus de 10 %, doit : […]	**X**	**X**

Exigences	Applicable à l'Interconnexion de l'Est	Applicable à l'Interconnexion du Québec
E13. Dans le cas des groupes de production non nucléaire qui étaient en service avant le 1er juillet 2015, et dont la protection en sous-fréquence est réglée pour se déclencher à une valeur supérieure à la courbe appropriée de la figure 2 :	**X**	**X**
13.1. Dans le cas des groupes de production non nucléaire qui étaient en service avant le 1er juillet 2015, et dont la protection en sous-fréquence est réglée pour se déclencher à une valeur supérieure à la courbe appropriée de la figure 2 :Chaque propriétaire d'installation de production doit communiquer à son coordonnateur de la planification les réglages existants de la protection en sous-fréquence et toute modification qui leur est apportée, ainsi que la justification technique des réglages.	**X**	**X**
13.2. Chaque coordonnateur de la planification de l'Ontario, du Québec et des provinces maritimes doit demander que soit assuré, par un distributeur ou un propriétaire d'installation de transport et conformément à l'annexe A, un délestage compensatoire suffisant pour compenser la perte de groupes de production dans le cas d'un déclenchement précoce à l'intérieur de l'îlot de DSF désigné par le coordonnateur de la planification à l'exigence E2.	**X**[3]	**X**

3 Uniquement à l'Ontario et aux provinces maritimes dans l'Interconnexion de l'Est

Exigences	Applicable à l'Interconnexion de l'Est	Applicable à l'Interconnexion du Québec
13.3. Chaque propriétaire d'installation de production dans les zones de coordonnateur de la planification de l'ISO New England (ISO NE) et du New York Independent System Operator (NYISO) doit demander que soit assuré, par un distributeur ou un propriétaire d'installation de transport et conformément à l'annexe B, un délestage suffisant pour compenser la perte de groupes de production dans le cas d'un déclenchement précoce à l'intérieur de l'îlot de DSF désigné par le coordonnateur de la planification à l'exigence E2.	**X**[4]	
E14. Chaque coordonnateur de la planification de l'Ontario, du Québec et des provinces maritimes doit s'appuyer sur les critères de l'annexe A pour déterminer le délestage compensatoire prescrit à l'alinéa 13.3 pour les groupes de production dans sa zone respective du NPCC.	**X**[5]	**X**
E15. Chaque propriétaire d'installation de production, distributeur et propriétaire d'installation de transport dans les zones de coordonnateur de la planification de l'ISO NE et du NYISO doit s'appuyer sur les critères de l'annexe B pour déterminer le délestage compensatoire prescrit à l'alinéa 13.4 pour les groupes de production dans sa zone respective du NPCC.	**X**[6]	

4 Uniquement les régions de ISO NE et NYISO dans l'Interconnexion de l'Est
5 Uniquement à l'Ontario et aux provinces maritimes dans l'Interconnexion de l'Est
6 Uniquement les régions de ISO NE et NYISO dans l'Interconnexion de l'Est

Exigences	Applicable à l'Interconnexion de l'Est	Applicable à l'Interconnexion du Québec
E16. Chaque propriétaire d'installation de production ayant des centrales nucléaires qui comportent des groupes de production dont les relais de déclenchement en sous-fréquence sont réglés au dessus de la courbe de déclenchement des groupes de production de l'Interconnexion de l'Est à la figure 2, selon les critères de conception utilisés pour l'obtention du permis, doit : […]	**X**	**X[7]**

7 Aucun groupe de production nucléaire n'est présentement inscrit au Registre des entités visées au Québec

3. Des explications permettant de comprendre pourquoi les paramètres du programme de délestage en sous-fréquence (DSF) pour l'Interconnexion de l'Est sont précisés aux tableaux 1 à 3 de l'annexe C tandis que pour l'Interconnexion du Québec la norme réfère « aux paramètres spécifiés par son coordonnateur de la planification »;

R3 - Le Coordonnateur ne peut pas expliquer les raisons exactes ayant mené le groupe de travail à ne pas inclure les paramètres du programme de délestage en sous-fréquence (DSF) de l'Interconnexion du Québec dans la norme. Toutefois, selon les informations recueillies auprès de membres du comité de rédaction de la norme de fiabilité régionale PRC-006-NPCC-2 et la constatation des éléments factuels, voici l'explication.

Nous comprenons qu'il a été décidé d'afficher les paramètres du programme DSF des entités du NPCC faisant partie de l'Interconnexion de l'Est directement dans la norme étant donné que celles-ci utilisent tous le même programme. Ainsi, la présence du programme directement dans la norme permettait d'uniformiser l'information et d'en faire une référence pour toutes les parties prenantes.

Cependant, cette pratique comporte un inconvénient. Tel qu'indiqué par l'exigence 4 de la norme PRC-006-3 (D.A.4 pour l'interconnexion du Québec), chaque coordonnateur de la planification doit évaluer la conception de son programme DSF au moins une fois tous les cinq ans. Si l'évaluation démontre que le programme n'est pas en mesure de satisfaire les exigences de performance, la conception d'un nouveau programme sera alors nécessaire. Ainsi, advenant une telle situation, une modification de la norme PRC-006-NPCC-2 devrait alors suivre afin de mettre les tableaux à jour dans l'annexe C. Cette pratique comporte un risque de non-conformité à l'exigence 3 de la norme PRC-006-NPCC-2 puisque dans un tel cas, les entités DSF devront mettre en œuvre l'implantation du nouveau programme, tel que spécifié par l'exigence 4 de la norme PRC-006-3, alors que les tableaux n'auront possiblement pas encore été mis à jour dans l'annexe C de la PRC-006-NPCC-2.

Étant donné que le programme DSF de HQT est différent de celui des autres entités du NPCC et que D.A.3 de la norme PRC-006-3 exige le coordonnateur de la planification à notifier les entités DSF dans sa zone, il a été jugé que le tableau des paramètres du programme DSF pour l'interconnexion du Québec pouvait être retiré de la PRC-006-NPCC-2. Ceci simplifie le processus lors d'une modification potentielle du programme DSF et diminue les chances d'une non-conformité.

4. Des explications permettant de comprendre la portée de la norme régionale PRC-006-NPCC-2 par rapport à la portée continentale de la norme PRC-006-3;

R4- La norme de fiabilité régionale PRC-006-NPCC-2 est complémentaire à la norme de portée continentale PRC-006-3, et ce, tel qu'indiqué dans la pièce B-0004[8] et B-0005[9] :

> ***« La norme de fiabilité régionale PRC-006-NPCC-2 supprime les dédoublements avec la norme continentale PRC-006-3, ajoute des spécificités permettant de retirer le « Directory 12 » du NPCC sur le programme de DSF, contient des critères de performance de DSF plus stricts que la norme continentale et harmonise les exigences et les critères de tous ces documents. »***

Les dédoublements contenus dans la version antérieure de la norme régionale PRC-006-NPCC-1, qui n'est pas en vigueur au Québec, avec la version continentale de la norme PRC-006-3 ainsi qu'avec le « Directory 12 » du NPCC, ont été supprimés dans la norme de fiabilité régionale PRC-006-NPCC-2.

Il est important de noter que les critères de performance du DSF sont plus stricts essentiellement pour l'Interconnexion de l'Est dans la norme PRC-006-NPCC-2 que dans la norme continentale. Pour l'Interconnexion du Québec, les critères de performance du DSF de la norme PRC-006-NPCC-2 sont les mêmes que ceux de la norme continentale PRC-006-3 tel qu'indiqué dans la section « Différences régionales pour l'*Interconnexion* du Québec ».

La norme PRC-006-NPCC-2 est applicable également aux propriétaires d'installation de production (GO), en plus des entités fonctionnelles applicables à la norme PRC-006-3, tel qu'indiqué aux sections « Applicabilité » des deux normes.

Le Coordonnateur souligne par la présente les explications contenues aux pièces B-0002[10] et B-0005[11]:

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8 B-0004 HQCF-1 document 1 - Présentation de la demande visant l'adoption de la norme de fiabilité PRC-006-NPCC-2 - Délestage en sous-fréquence automatique, page 4 de 9 lignes 15 à 19, consulté en ligne le 30 septembre 2020, http://publicsde.regie-energie.qc.ca/projets/555/DocPrj/R-4131-2020-B-0004-Demande-Piece-2020_08_18.pdf

9 B-0005 HQCF-1 document 2 – Informations relatives aux normes, pages 1 de 7, paragraphe 1.2, consulté en ligne le 30 septembre 2020, http://publicsde.regie-energie.qc.ca/projets/555/DocPrj/R-4131-2020-B-0005-Demande-Piece-2020_08_18.pdf

10 B-0002 Demande d'adoption de la norme de fiabilité PRC-006-NPCC-2 – Délestage en sous-fréquence automatique, pièce B-0002 page 2 paragraphe 9, consulté en ligne le 30 septembre 2020 http://publicsde.regie-energie.qc.ca/projets/555/DocPrj/R-4131-2020-B-0002-Demande-Dem-2020_08_18.pdf

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« La Norme est une norme de fiabilité régionale du NPCC qui vise le délestage en sous-fréquence (DSF) automatique. Elle établit pour le NPCC des exigences de programme de DSF plus rigoureuses et plus spécifiques que celles de la norme de la NERC PRC-006-3, qui est de portée continentale. L'objectif d'un programme de DSF est d'arrêter et de corriger les baisses de fréquence, tel que plus amplement décrit à la pièce HQCF-1, document 2. »

« La norme de fiabilité régionale PRC-006-NPCC-2 établit des exigences de programme de DSF plus rigoureuses et plus spécifiques que celles de la norme NERC PRC 006 de portée continentale, entre autres, la norme PRC-006-NPCC-2 :.

- ***Vise la fonction GO, alors que dans la version continentale de la NERC PRC-006-3 ne le vise pas;***
- ***Exige au PC de communiquer aux entités visées le périmètre des îlots de DSF, désignés selon la norme NERC PRC 006 de portée continentale relative au DSF, sur demande;***
- ***Ajoute la possibilité pour les TO ou le DP de calculer la charge nette délestée par le DSF si la mesure n'est pas disponible;***
- ***Ajoute des exigences aux GO ayant un nouveau groupe de production, ou encore un groupe existant dont la capacité nette a été accrue de plus de 10 %;***
- ***Ajoutes des exigences pour les groupes de production non nucléaire qui étaient en service avant le 1er juillet 2015, et dont la protection en sous-fréquence est réglée pour se déclencher à une valeur supérieure à la courbe appropriée de la figure 2.***

[…]

- ***E10 : réglage des relais de déclenchement en sous-fréquence de groupe de production selon la figure 2. Cette exigence est déjà couverte par la norme PRC-024-1. Les seuils, de la figure 2 - Interconnection Generator Tripping de la PRC-006-NPCC-2 [PRC 006 NPCC 2 Programme de délestage en sous-fréquence – Seuils pour le réglage du déclenchement en sous-fréquence des groupes de production], sont les mêmes seuils que la norme PRC-024-1 annexe 1 table de l'Interconnexion du Québec;***
- ***E11 : Le GO doit communiquer les réglages de déclenchement en sous-fréquence des groupes de production et leur temporisation. La***

B-0005 HQCF-1 document 2 – Informations relatives aux normes, pages 5 et 6 de 7, consulté en ligne le 30 septembre 2020, http://publicsde.regie-energie.qc.ca/projets/555/DocPrj/R-4131-2020-B-0005-Demande-Piece-2020_08_18.pdf

NERC PRC-024-1 E4 permet un délai de 60 jours civils alors que la PRC-006-NPCC-2 permet un délai de 45 jours civils;

- ***E12 : ajoute des exigences aux GO ayant un nouveau groupe de production, ou encore un groupe existant dont la capacité nette a été accrue de plus de 10 %. Ces exigences ajoutent des critères de conception à ces GOs. Dans l'Interconnexion du Québec, les "Exigences techniques de raccordement de centrales au réseau de transport d'Hydro-Québec" sections 6.3 et 6.3.3 inclut des exigences similaires pour les centrales de production. Ainsi, exigence E12 n'est donc pas une toute nouvelle exigence en tant que telle, par contre ces exigences seront soumises à l'applicabilité de la PRC-006-NPCC-2;***
- ***E13: des exigences spécifiques sont exigées pour les groupes de production non nucléaire qui étaient en service avant le 1er juillet 2015, et dont la protection en sous-fréquence est réglée pour se déclencher à une valeur supérieure à la courbe appropriée de la figure 2. Encore une fois, les exigences de la figure 2 sont identiques aux exigences de l'annexe 1A (Québec) de la PRC-006-3 et la table de l'annexe 1 Interconnexion du Québec de la PRC-024-1, de ce fait, la conformité à la figure 2 ne devrait pas avoir d'impact significatif dans l'Interconnexion du Québec. Si un GO n'est pas en mesure de respecter les exigences de la figure 2, le PC devra mettre œuvre un délestage compensatoire suffisant pour compenser la perte de groupes de production dans le cas d'un déclenchement précoce à l'intérieur de l'îlot de DSF. À la suite d'une vérification auprès du PC, il y a une seule installation dans l'Interconnexion du Québec qui ne respecte pas la figure 2.»***

L'exigence 16 de la norme PRC-006-NPCC-2 s'applique aux *propriétaires d'installation de production* ayant des centrales nucléaires. Toutefois, il est à noter que présentement aucune installation nucléaire n'est inscrite au Registre des entités visées.

5. Les équations qui permettent de définir la courbe pour l'Interconnexion du Québec (à la figure 2) en s'assurant de faire la différence selon leur source, qu'il s'agisse de la norme PRC-006 de portée continentale ou de celle régionale relative au DSF, au même titre que les données des courbes présentées à la figure 1;

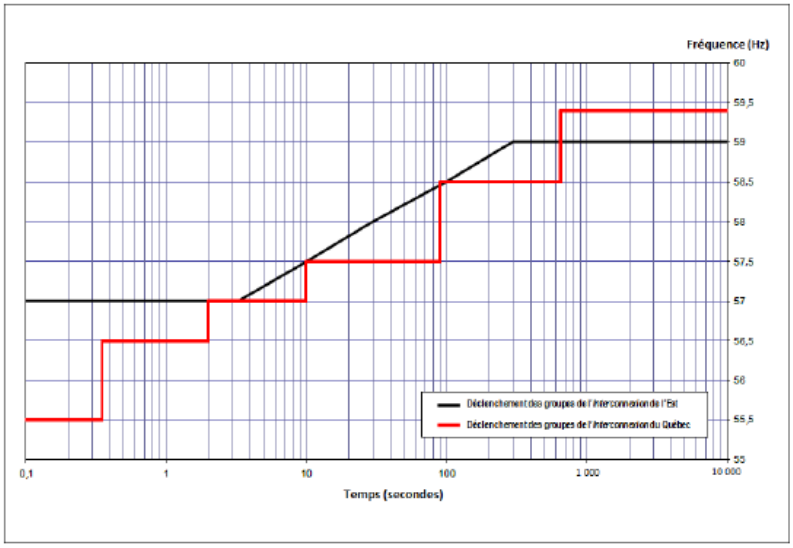
R5 Le programme de délestage en sous-fréquence est établi comme suit selon la figure 2 de la norme PRC-006-NPCC-2 et l'annexe 1A de l'Annexe Québec de la norme PRC-006-3 pour la courbe de déclenchements groupes production de l'Interconnexion du Québec :

Durée de sous-fréquence		Source
Fréquence (Hz)	Temps (s)	
<55,5	Déclenchement instantané	PRC-006-NPCC-2 (norme régionale relative au DSF)
≤56,5	0,35	PRC-006-3 (norme de portée continentale)
≤57,0	2	PRC-006-3 (norme de portée continentale)
≤57,5	10	PRC-006-3 (norme de portée continentale)
≤58,5	90	PRC-006-3 (norme de portée continentale)
≤59,4	660	PRC-006-NPCC-2 (norme régionale relative au DSF)
>59,4	Fonctionnement continu	PRC-006-NPCC-2 (norme régionale relative au DSF)

Figure 2 PRC-006-NPCC-2

Norme PRC-006-NPCC-2 — Délestage en sous-fréquence automatique

Figure 2
PRC-006-NPCC-2
Programme de délestage en sous-fréquence – Seuils pour le réglage du déclenchement en sous-fréquence des groupes de production

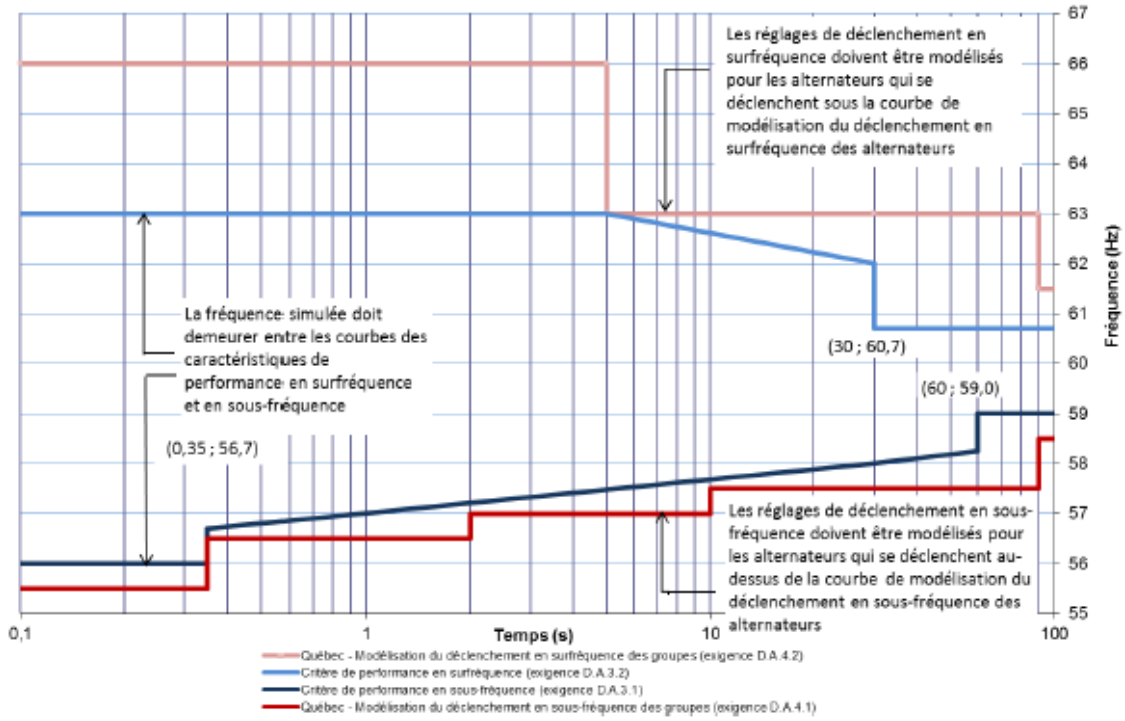


Extrait PRC-006-3 – Annexe 1A (Québec)

Norme PRC-006-3 — Délestage en sous-fréquence automatique

Annexe QC-PRC-006-3
Dispositions particulières de la norme PRC-006-3 applicables au Québec

Programme de délestage en sous-fréquence
Courbes de modélisation et des critères de performance
Variantes régionales D.A.3 (alinéas D.A.3.1 à D.A.3.3) et D.A.4 (alinéas D.A.4.1 à D.A.4.3)



Modélisation du déclenchement en sous-fréquence des groupes					Critères de performance en sous-fréquence		
t ≤ 0,35 s	t ≤ 2 s	t ≤ 10 s	t ≤ 90 s	t > 90 s	t ≤ 0,35 s	0,35 s < t ≤ 60 s	t > 60 s
f = 55,5 Hz	f = 56,5 Hz	f = 57,0 Hz	f = 57,5 Hz	f = 58,5 Hz	f = 56,0 Hz	f = 0,72 log(t) + 57,03 Hz	f = 59 Hz

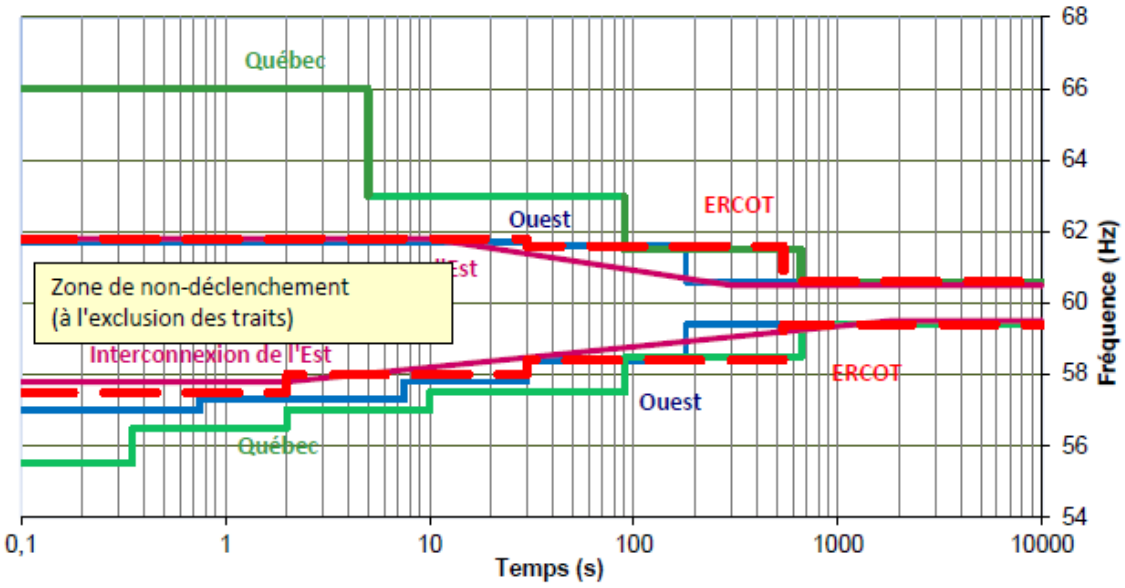
Il est important de noter que la courbe de la figure 2 de la norme de fiabilité régionale PRC-006-NPCC-2 est identique à la courbe de l'annexe 1 de la norme PRC-024-1 en vigueur dans l'Interconnexion du Québec.

Extrait PRC-024-1 – Annexe 1

Norme PRC-024-1 – Réglages des relais de protection en fréquence et en tension des groupes de production

PRC-024 – Annexe 1

COURBE D'EXCURSION ADMISSIBLE PAR RAPPORT À LA FRÉQUENCE NOMINALE



Interconnexion du Québec

Durée de surfréquence		Durée de sous-fréquence	
Fréquence (Hz)	Temps (s)	Fréquence (Hz)	Temps (s)
>66,0	Déclenchement instantané	<55,5	Déclenchement instantané
≥63,0	5	≤56,5	0,35
≥61,5	90	≤57,0	2
≥60,6	660	≤57,5	10
<60,6	Fonctionnement continu	≤58,5	90
		≤59,4	660
		>59,4	Fonctionnement continu

6. Des explications permettant de comprendre les interrelations entre les normes PRC-006-3, PRC-006-NPCC-2 et PRC-024-1.

R6 Tel qu'indiqué à la réponse 4, la norme de fiabilité régionale PRC-006-NPCC-2 est complémentaire à la norme de portée continentale PRC-006-3, ajoute des spécificités permettant de retirer le « Directory 12 » du NPCC sur le programme de DSF et harmonise les exigences et les critères de tous ces documents.

Tel qu'indiqué à la page 5 de la pièce B-0005 HQCF-1 document 2 – Informations relatives aux normes et inclus à la réponse 3, la norme de fiabilité régionale PRC-006-NPCC-2 inclut des exigences supplémentaires applicables aux GO ainsi qu'aux DP qui sont propriétaires ou responsables de l'exploitation ou de la commande des équipements de DSF requis dans le cadre du programme de DSF établi par les coordonnateurs de la planification et aux TO qui sont propriétaires ou responsables de l'exploitation ou de la commande des équipements de DSF requis dans le cadre du programme de DSF établi par les coordonnateurs de la planification.

Pour les entités de la zone géographique du NPCC dans l'Interconnexion de l'Est, la norme de fiabilité régionale PRC-006-NPCC-2 contient des critères de performance de DSF plus stricts que la norme continentale. Pour l'Interconnexion du Québec, les critères de performance de DSF de la norme continentale et la norme régionale sont identiques.

Pour les GO de la zone géographique du NPCC dans l'Interconnexion de l'Est, la courbe de déclenchements des groupes production de la norme de fiabilité régionale PRC-006-NPCC-2 est différente de la courbe de déclenchements groupes production de la norme de fiabilité PRC-024-2. Pour l'Interconnexion du Québec, la courbe de déclenchement des groupes production de la norme de fiabilité régionale PRC-006-NPCC-2 est identique la courbe de déclenchements groupes production de la norme de fiabilité PRC-024-1.

ANNEXE A –
Annotations de la norme PRC-006-NPCC-2 envoyées au NPCC (en anglais)

A. Introduction

Commenté [BAVL1]: Translators' remarks

1. **Title:** Automatic Underfrequency Load Shedding
2. **Number:** PRC-006-NPCC-2
3. **Purpose:** The NPCC Automatic Underfrequency Load Shedding (UFLS) regional Reliability Standard establishes more stringent and specific NPCC UFLS program requirements than the NERC continent-wide PRC-006 standard. The program is designed such that declining frequency is arrested and recovered in accordance with established NPCC performance requirements stipulated in this document.
4. **Applicability:**
   - **4.1. Functional Entities:**
     - **4.1.1.** Generator Owner
     - **4.1.2.** Planning Coordinator
     - **4.1.3.** Distribution Providers that are responsible for the ownership, operation, or control of UFLS equipment as required by the UFLS program established by the Planning Coordinators
     - **4.1.4.** Transmission Owners that are responsible for the ownership, operation, or control of UFLS equipment as required by the UFLS program established by the Planning Coordinators
5. **Effective Date:** See Implementation Plan.

B. Requirements and Measures

R1. Each Planning Coordinator in the Eastern Interconnection portion of NPCC shall design an UFLS program, pertaining to islands wholly within the NPCC Region, having performance characteristics that prevents the frequency from remaining below 59.5 Hz for more than 30 seconds in accordance with Figure 1. *[Violation Risk Factor: High] [Time Horizon: Long Term Planning].*

Commenté [BAVL2]: Missing period at the end of the sentence.

M1. Each Planning Coordinator shall have evidence such as reports, system studies and/or real-time power flow data captured from actual system events and other dated documentation that demonstrates it meets Requirement R1.

R2. Each Planning Coordinator shall provide UFLS island boundaries, as identified per the NERC continent-wide PRC-006 Standard on UFLS, to Distribution Providers, Generator Owners, and Transmission Owners within 30 calendar days of receipt of a request. *[Violation Risk Factor: Lower] [Time Horizon: Long Term Planning]*

M2. Each Planning Coordinator shall have evidence such as dated documentation that demonstrates that it meets requirement R2.

R3. Each Distribution Provider and Transmission Owner in the Eastern Interconnection portion of NPCC shall implement an automatic UFLS program, reflecting normal operating conditions, excluding outages. The automatic UFLS program shall be implemented on an island basis for each identified island per the NERC continent-wide PRC-006 Standard on UFLS as follows: *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*

- The UFLS program shall be implemented by each Distribution Provider and Transmission Owner according to the frequency thresholds, nominal operating times, and load shedding amounts specified in Attachment C, Tables 1-3; or
- The UFLS program shall be implemented collectively by multiple Distribution Providers or Transmission Owners, as long as they reside in the same UFLS island identified by the Planning Coordinator per Requirement R2. These multiple Distribution Providers or Transmission Owners, via mutual agreement, shall act as a single entity to provide an aggregated automatic UFLS program that sheds their coincident peak aggregated net Load according to the frequency thresholds, total nominal operating time, and load shedding amounts specified in Attachment C, Tables 1-3.

M3. Each Distribution Provider and Transmission Owner in the Eastern Interconnection portion of NPCC shall have evidence such as documentation or reports containing the location and amount of load to be tripped in their respective areas, and the corresponding frequency thresholds, on those circuits included in its UFLS program identified in Requirement R3. (Attachment C, Tables 1-3).

R4. Each Distribution Provider or Transmission Owner in the Eastern Interconnection portion of NPCC that does not meet the UFLS program parameters specified in Attachment C, Table 1-3, and each Distribution Provider or Transmission Owner in the Quebec Interconnection that does not meet the UFLS program parameters specified by its Planning Coordinator shall: *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*

- Within 30 calendar days of determining that it does not meet the specified parameters, notify its Planning Coordinator that it does not meet the UFLS program parameters; and
- Within the following 180 calendar days from notification of the Planning Coordinator,

(1) develop a Corrective Action Plan and a schedule for implementation that is mutually agreed upon with its Planning Coordinator or
(2) provide its Planning Coordinator with a technical study that demonstrates that the deviations from the program parameters will not result in failure of UFLS performance criteria being met for any island. The technical study must be acceptable to the Planning Coordinator prior to implementing deviations from program parameters and shall demonstrate coordination with UFLS programs of all entities residing within the same island(s) identified by the Planning

Commenté [BAVL3]: Usually, paragraphs bearing an ''and'' should be numbered paragraphs; these paragraphs should be numbered 4.1 and 4.2 especially because they are a procedure: do 1, then 2.

Commenté [BAVL4]: Furthermore, paragraphs separated by ''or'' should bear bullets rather than numbers that give the impression of a progression when in fact these are options.

Coordinator in Requirement R2. The technical study shall also demonstrate coordination with other UFLS programs of adjoining Planning Coordinators, or (3) provide its Planning Coordinator with an analysis demonstrating that no alternative load shedding solution is available that would allow the Distribution Provider or Transmission Owner to comply with UFLS Attachment C Table 2 or Attachment C Table 3.

M4. Each Distribution Provider or Transmission Owner shall have evidence such as reports analysis, system studies and dated documentation that demonstrates that it meets Requirement R4.

R5. Each Planning Coordinator shall develop and review settings for inhibit thresholds at least once per five calendar years (such as, but not limited to, voltage, current and time) to be utilized within its region's UFLS program. *[Violation Risk Factor: Medium] [Time Horizon: Long Term Planning]*

M5. Each Planning Coordinator shall have evidence such as reports, system studies or analysis that demonstrates that it meets Requirement R5.

R6. Each Planning Coordinator shall provide each Transmission Owner and Distribution Provider within its Planning Coordinator area the applicable inhibit thresholds within 30 calendar days of any changes. *[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]*

M6. Each Planning Coordinator shall provide evidence such as letters, emails or other dated documentation that demonstrates that it meets Requirement R6.

R7. Each Distribution Provider and Transmission Owner that receives a notification pursuant to Requirement R6 shall develop and submit an implementation plan with respect to inhibit thresholds for approval by the Planning Coordinator within 90 calendar days of the request from the Planning Coordinator. *[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]*

Commenté [BAVL5]: Request should be replaced by notification. The entity does not receive a request from its PC but a notification.

M7. Each Distribution Provider and Transmission Owner shall provide evidence such as letters, emails, or other dated documentation that demonstrates that it meets Requirement R7.

R8. Each Distribution Provider and Transmission Owner shall implement the inhibit thresholds provided by the Planning Coordinator in accordance with Requirement R6 and based on the Planning Coordinator approved implementation plan in accordance with R7. *[Violation Risk Factor: High] [Time Horizon: Operation Planning]*

M8. Each Distribution Provider and Transmission Owner shall provide evidence such as test reports, data sheets, completed work orders, or other documentation that demonstrates that it meets Requirement R8.

R9. Each Transmission Owner and Distribution Provider shall annually provide documentation, with no more than 15 calendar months between updates, to its Planning Coordinator of the actual net Load that would have been shed by the UFLS relays at each UFLS stage. The actual net Load shall be coincident with the entity's integrated hourly peak net Load during the previous year, as determined by measuring or calculating Load through the switches that would disconnect load if triggered by the UFLS relays. If measured data is unavailable then calculated data may be used. *[Violation Risk Factor: Lower] [Time Horizon: Long Term Planning]*

M9. Each Distribution Provider and Transmission Owner shall provide evidence such as reports, spreadsheets or other dated documentation submitted to its Planning Coordinator that indicates the net amount of load shed and the percentage of its peak load at each stage of its UFLS program to demonstrate that it meets Requirement R9.

Commenté [GJ6]: Load that would have been shed

R10. Each Generator Owner shall set each generator underfrequency trip relay, if so equipped, on or below the appropriate generator underfrequency trip protection setting threshold curve in Figure 2, except as otherwise exempted in Requirements R13 and R16. *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*

M10. Each Generator Owner shall provide evidence such as reports, data sheets, spreadsheets or other documentation that demonstrates that it meets Requirement R10.

R11. Each Generator Owner shall transmit the generator underfrequency trip setting and time delay within 45 calendar days of the Planning Coordinator's request. *[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]*

M11. Each Generator Owner shall provide evidence such as emails, letters or other dated documentation that demonstrates that it meets Requirement R11.

R12. Each Generator Owner with a new generating unit, or an existing generator increasing its net capability by greater than 10% shall: *[Violation Risk Factor: Medium] [Time Horizon: Long Term Planning]*

- **12.1** Design measures to prevent the generating unit from tripping directly or indirectly for underfrequency conditions above the appropriate generator tripping threshold curve in Figure 2.
- **12.2** Design auxiliary system(s) or devices used for the control and protection of auxiliary system(s), necessary for the generating unit operation such that they will not trip the generating unit during underfrequency conditions above the appropriate generator underfrequency trip protection setting threshold curve in Figure 2.

M12. Each Generator Owner shall provide evidence such as reports, data sheets, specifications, memorandum or other documentation that demonstrates that it meets Requirement R12.

R13. For existing non-nuclear units in service prior to July 1, 2015, that have underfrequency protections set to trip above the appropriate curve in Figure 2: *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*

13.1 Each Generator Owner shall set the underfrequency protection to operate at the lowest frequency allowed by the plant design and licensing limitations.

13.2 Each Generator Owner shall transmit the existing underfrequency settings and any changes to the underfrequency settings along with the technical basis for the settings to the Planning Coordinator.

13.3 Each Planning Coordinator in Ontario, Québec and the Maritime Provinces shall arrange for compensatory load shedding, in accordance with Attachment A and as provided by a Distribution Provider or Transmission Owner, that is adequate to compensate for the loss of generator(s) due to early tripping that is within the UFLS island identified by the Planning Coordinator in Requirement R2.

13.4 Each Generator Owner in the ISO-NE Planning Coordinator area and in NYISO Planning Coordinator area shall arrange for compensatory load shedding, in accordance with Attachment B and as provided by a Distribution Provider or Transmission Owner, that is adequate to compensate for the loss of generator(s) due to early tripping that is within the UFLS island identified by the Planning Coordinator in Requirement R2.

M13. Each Generator Owner with existing non-nuclear units in service prior to July 1, 2015 which have underfrequency tripping that is not compliant with Requirement R10 shall provide evidence such as reports, spreadsheets, memorandum or dated documentation demonstrating that it meets Requirement R13.

Commenté [GJ7]: The PC should also be required to provide compliance with Part 13.3.

R14. Each Planning Coordinator in Ontario, Quebec and the Maritime provinces shall apply the criteria described in Attachment A to determine the compensatory load shedding that is required in Requirement R13.3 for generating units in its respective NPCC area. *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*

Commenté [BAVL8]: There is no requirement R13.3. Should be Requirement 13, Part3.

M14. Each Planning Coordinator in Ontario, Quebec and Maritime provinces shall provide evidence such as reports, memorandum or other documentation that demonstrates that it followed the methodology described in Attachment A and meets Requirement R14.

R15. Each Generator Owner, Distribution Provider or Transmission Owner within the ISO-NE Planning Coordinator area and in NYISO Planning Coordinator Area shall apply the criteria described in Attachment B to determine the compensatory load shedding that

is required in Requirement R13.4 for generating units in its respective NPCC area. *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*

Commenté [BAVL9]: Same comment as above.

M15. Each Generator Owner, Distribution Provider or Transmission Owner within the Planning Coordinator area of ISO-NE or the NYISO shall provide evidence such as reports, memorandum, or other documentation that demonstrates that it followed the methodology described in Attachment B and meets Requirement R15.

R16. Each Generator Owner of existing nuclear generating plants with units that have underfrequency relay threshold settings above the Eastern Interconnection generator tripping curve in Figure 2 based on their licensing design shall: *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*

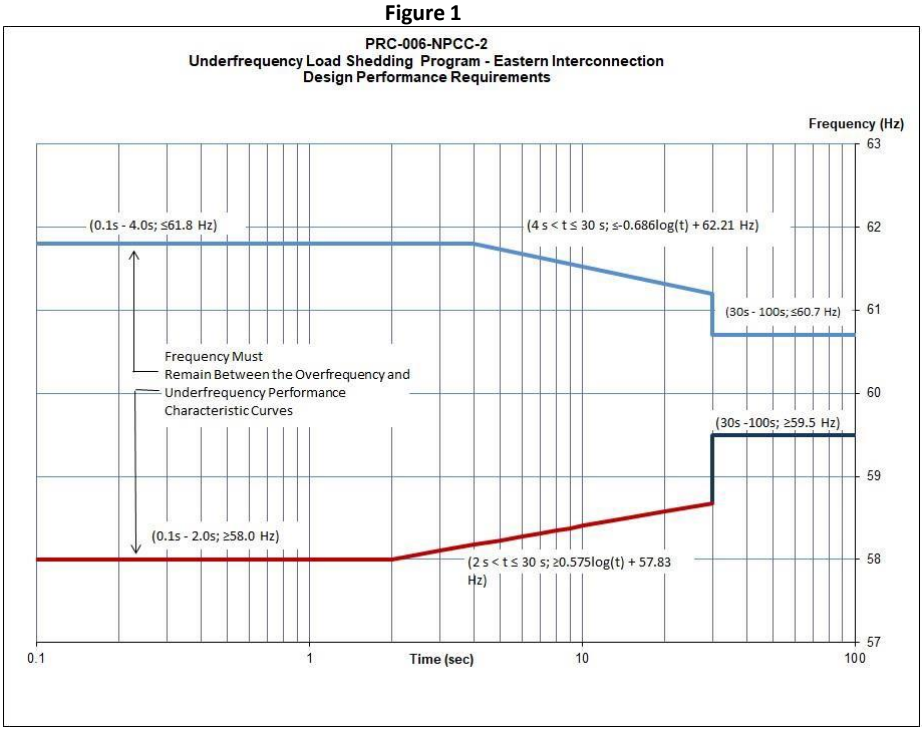
16.1 Set the underfrequency protection to operate at a frequency setting that is as low as possible in accordance with the plant design and licensing limitations but not greater than 57.8 Hz.

16.2 Set the frequency trip setting upper tolerance to no greater than + 0.1 Hz.

16.3 Transmit the initial frequency trip setting and any changes to the setting and the technical basis for the settings to the Planning Coordinator.

M16. Each Generator Owner of nuclear units that have generator trip settings above the generator trip curve in Figure 2 shall provide evidence such as letters, reports and dated documentation that demonstrates that it meets Requirement R16.

Figure 1



NERC PRC-006 Overfrequency Requirements (Continent-Wide Standard on UFLS)
NERC PRC-006 Underfrequency Requirements (Continent-Wide Standard on UFLS) - out to 30 seconds only
NERC PRC-006-NPCC Underfrequency Requirements (Regional Standard on UFLS)- more stringent than Content-Wide Standard from 30 - 100 seconds

Commenté [BAVL10]: Error in the last line "Content-Wide Standard" rather than Continent-Wide Standard.

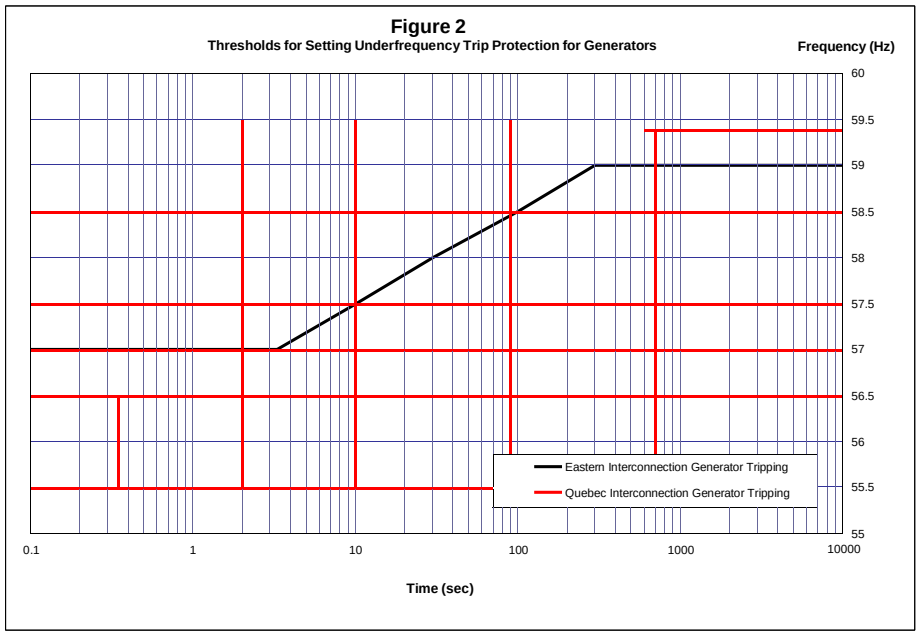
Curve Data:

Overfrequency Requirements		**Source**
t ≤ 4 s	f = 61.8 Hz	NERC PRC-006 (Continent-Wide Standard on UFLS)
4 s < t ≤ 30 s	f = -0.686log(t) + 62.21 Hz	
t > 30 s	f = 60.7 Hz	

Underfrequency Requirements		**Source**
t ≤ 2 s	f = 58.0 Hz	NERC PRC-006 (Continent-Wide Standard on UFLS)
2 s < t ≤ 30 s	f = 0.575log(t) + 57.83 Hz	
t > 30 s	f = 59.5 Hz	NERC PRC-006-NPCC (Regional Standard on UFLS)

Figure 2
PRC-006-NPCC-2
Underfrequency Load Shedding Program – Thresholds for Setting Underfrequency Trip Protection for Generators

Commenté [GJ11]: Please note this annotated Word document was converted from a PDF version. Thus the figures did not correctly follow; the present document should not directly be used in preparing a revised version of the Standard.



C. Compliance

1. **Compliance Monitoring Process**

1.1. Compliance Enforcement Authority:
Northeast Power Coordinating Council

1.2. Evidence Retention:

The Distribution Provider and Transmission Owner shall keep evidence~~s~~ for three calendar years for Measures 2, 3, 4, 5, 8, and 9.

The Planning Coordinator shall keep evidence for three calendar years for Measures 1, 2, 5, 6, and 7.

The Distribution Provider, Transmission Owner, and Generator Owner shall keep evidence~~s~~ for three calendar years for Measure~~s~~ 15.

The Generator Owner shall keep evidence for three calendar years for Measures 10, 11, 12, 13, and 16.

1.3. Compliance Monitoring and Enforcement Program:

Compliance Audit

Self-Certification

Spot Checking

Compliance Violation Investigation

Self-Reporting

Complaints

Commenté [GJ12]: Should be 3,4,7,8,9

Commenté [GJ13]: Should be 1,2,5,6,13,14

Commenté [BAVL14]: Given the following list, the English version should state ''Processes'' rather than Program.

Violation Severity Levels

R #	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1.	N/A	N/A	N/A	The Planning Coordinator failed to design an UFLS program having performance characteristics that prevent frequency from remaining below 59.5 Hz in accordance with Figure 1.
R2.	The Planning Coordinator provided its UFLS island boundaries, as identified per the NERC continent-wide PRC-006 Standard on UFLS but did so more than 30 calendar days and up to and including 40 days following a request.	The Planning Coordinator provided its UFLS island boundaries, as identified per the NERC continent-wide PRC-006 Standard on UFLS but did so more than 40 calendar days but less than and including 50 days following a request.	The Planning Coordinator provided its UFLS island boundaries, as identified per the NERC continent-wide PRC-006 Standard on UFLS but did so more than 50 calendar days but less than and including 60 days following a request.	The Planning Coordinator failed to provide its UFLS island boundaries, as identified per the NERC continent-wide PRC-006 Standard on UFLS within 60 calendar days following a request.
R3.	The Distribution Provider or Transmission Owner failed to apply appropriate settings on 20% or less of the relays identified as included in the UFLS program, or amount of load tripped is within 10% deviation from the required amount of Load required to be shed at each stage.	The Distribution Provider or Transmission Owner failed to apply appropriate settings on 20% - 40% of the relays identified as included in the UFLS program, or amount of load tripped is within 20% deviation from the required amount of Load required to be shed at each stage. ~~m~~	The Distribution Provider or Transmission Owner failed to apply appropriate settings on 40% - 60% of the relays identified as included in the UFLS program, or amount of load tripped is within 30% deviation from the required amount of Load required to be shed at each stage.	The Distribution Provider or Transmission Owner failed to apply appropriate settings on > 60% of the relays identified as included in the UFLS program, or amount of load tripped has a > 30% deviation from the required amount of Load required to be shed at each stage.
R4.	The Distribution Provider or Transmission Owner that cannot meet the tolerances and/or number of stages and frequency set points specified in the UFLS Program fulfilled its obligations for	The Distribution Provider or Transmission Owner that cannot meet the tolerances and/or number of stages and frequency set points specified in the UFLS Program fulfilled its obligations for	The Distribution Provider or Transmission Owner that cannot meet the tolerances and/or number of stages and frequency set points specified in the UFLS Program fulfilled its obligations but exceeded the permissible	The Distribution Provider or Transmission Owner that cannot meet the tolerances and/or number of stages and frequency set points specified in the UFLS Program failed to meet all of items in Requirement 5 within 60

Commenté [BAVL15]: There is a superfluous period here.

Commenté [BAVL16]: Not written as the requirement's text.

Commenté [GJ18]: > 20% (because 20% is Lower VSL)

Commenté [GJ21]: > 40% (because 40% is Moderate VSL)

Commenté [GJ19]: > 10 % but < 20%

Commenté [GJ22]: > 20 but < 30%

Commenté [GJ17]: Missing period.

Commenté [GJ20]: Missing period and superfluous "m".

Commenté [BAVL23]: Missing period.

Commenté [GJ24]: This whole section needs rewriting. The text should refer to the UFLS program parameters, references are wrong, inconsistency in phrasing for the various VSLs.

	Requirement R5, Parts %.1 through Part 5.4 but exceeded the permissible time frame for one or more of the 4 items by a period of up to 10 calendar days but less than or equal to 20 calendar days.	Requirement R5, Parts %.1 through Part 5.4 but exceeded the permissible time frame for one or more of the 4 items within a time greater than 20 calendar days but less than or equal to 30 calendar days.	time frame for one or more of the 4 items within a time greater than 30 calendar days but less than or equal to 60 calendar days.	calendar days of permissible time for each item.
R5.	The Planning Coordinator developed or reviewed settings for inhibit thresholds at least once per five calendar years, for less than 100% but more than (and including) 95% of relays within its region's UFLS program.	The Planning Coordinator developed or reviewed settings for inhibit thresholds at least once per five calendar years, for less than 95% but more than (and including) 90% of relays within its region's UFLS program.	The Planning Coordinator developed or reviewed settings for inhibit thresholds at least once per five calendar years, for less than 90% but more than (and including) 85% of relays within its region's UFLS program.	The Planning Coordinator developed or reviewed settings for inhibit thresholds at least once per five calendar years, for less than 85% of relays within its region's UFLS program.
R6.	The Planning Coordinator provided to a Transmission Owner or Distribution Provider within its Planning Coordinator area the applicable inhibit thresholds more than 30 calendar days and up to and including 40 calendar days of any changes.	The Planning Coordinator provided to a Transmission Owner or Distribution Provider within its Planning Coordinator area the applicable inhibit thresholds more than 40 calendar days but less than and including 50 calendar days of any changes.	The Planning Coordinator provided to a Transmission Owner or Distribution Provider within its Planning Coordinator area the applicable inhibit thresholds more than 50 calendar days but less than and including 60 calendar days of any changes.	The Planning Coordinator failed to provide to a Transmission Owner or Distribution Provider within its Planning Coordinator area the applicable inhibit thresholds within 60 calendar days after any changes
R7.	The Distribution Provider or Transmission Owner developed and submitted its implementation plan more than 90 calendar days and up to and including 100 calendar days following the request.	The Distribution Provider or Transmission Owner developed and submitted its implementation plan more than 100 calendar days and up to and including 110 calendar days following the request.	The Distribution Provider or Transmission Owner developed and submitted its implementation plan more than 110 calendar days and up to and including 120 calendar days following the request.	The Distribution Provider or Transmission Owner failed to develop and submit its implementation plan within 120 days following the request.
R8.	Implemented the inhibit threshold settings provided by the Planning Coordinator in accordance with the Planning Coordinator approved implementation plan for	The Distribution Provider or Transmission Owner implemented the inhibit threshold settings provided by the Planning Coordinator in accordance with	The Distribution Provider or Transmission Owner implemented the inhibit threshold settings provided by the Planning Coordinator in accordance with	The Distribution Provider or Transmission Owner implemented the inhibit threshold settings provided by the Planning Coordinator in accordance with

Commenté [BAVL25]: Should be ''notification''. Same comment applies to each VSL in this row.

Commenté [GJ26]: Missing text: The Distribution Provider or Transmission Owner

	less than 100% but more than (and including) 95% of UFLS relays.	the Planning Coordinator approved implementation plan for less than 95% but more than (and including) 90% of UFLS relays.	the Planning Coordinator approved implementation plan for less than 90% but more than (and including) 85% of UFLS relays.	the Planning Coordinator approved implementation plan for less than 85% of UFLS relays.
R9.	The Distribution Provider or Transmission Owner provided to its Planning Coordinator documentation of the actual net Load that would have been shed by the UFLS relays at each UFLS stage as described in Requirement R11 more than 15 calendar months but less than (and including) 16 calendar months since last update.	The Distribution Provider or Transmission Owner provided to its Planning Coordinator documentation of the actual net Load that would have been shed by the UFLS relays at each UFLS stage as described in Requirement R11 more than 16 calendar months but less than (and including)17 calendar months since last update.	The Distribution Provider or Transmission Owner provided to its Planning Coordinator documentation of the actual net Load that would have been shed by the UFLS relays at each UFLS stage as described in Requirement R11 more than 17 calendar months but less than (and including)18 calendar months since last update.	The Distribution Provider or Transmission Owner failed to provide to its Planning Coordinator documentation of the actual net Load that would have been shed by the UFLS relays at each UFLS stage as described in Requirement R11 within 18 calendar months since last update.
R10.	N/A	N/A	N/A	The Generator Owner did not set each generator underfrequency trip relay, if so equipped, on or below the appropriate generator underfrequency trip protection settings threshold curve in Figure 2, except as otherwise exempted.
R11.	The Generator Owner transmitted the generator underfrequency trip setting and time delay more than 45calendar days and less than (and including) 55 calendar days of the Planning Coordinator's request.	The Generator Owner transmitted the generator underfrequency trip setting and time delay more than 55 calendar days and less than (and including) 65 calendar days of the Planning Coordinator's request.	The Generator Owner transmitted the generator underfrequency trip setting and time delay more than 65 calendar days and less than (and including) 75 calendar days of the Planning Coordinator's request.	The Generator Owner failed to transmit the generator underfrequency trip setting and time delay within 75 calendar days of the Planning Coordinator's request.
R12.	N/A	N/A	The Generator Owner with a new generating unit, or an existing	The Generator Owner with a new generating unit, or an existing generator increasing its net

Commenté [BAVL27]: This reference is erroneous and does not appear in the requirement text. This comment applies to each of the VSLs on tis row.

			generator increasing its net capability by greater than 10%: Did not fulfill the obligation of Requirement R12; Part 12.1 OR Did not fulfill the obligation of Requirement R12, Part 12.2.	capability by greater than 10%, did not fulfill the obligations of Requirement R12, Part 12.1 and Part 12.2.
R13.	N/A	The Generator Owner failed to transmit the existing underfrequency settings and any changes to the underfrequency settings along with the technical basis for the settings to the Planning Coordinatoras specified in Requirement R13, Part 13.2.	The Generator Owner failed to set the underfrequency protection to operate at the lowest frequency allowed by the plant design and licensing limitations a specified in Requirement 13, Part 13.1	The Planning Coordinator in Ontario, Québec and the Maritime Provinces or the Generator Owner within the ISO-NE and in NYISO Planning Coordinator areas failed to arrange for compensatory load shedding as specified in Requirement R13, Part 13.3.
R14.	N/A	N/A	N/A	The Planning Coordinator did not apply the criteria described in Attachment A to determine the compensatory load shedding that is required.
R15.	N/A	N/A	N/A	The Generator Owner, Distribution Provider, or Transmission Owner did not apply the criteria described in Attachment B to determine the compensatory load shedding that is required.
R16.	N/A	The Generator Owner failed to transmit the initial frequency trip setting and any changes to the setting and the technical basis for the settings to the Planning	The Generator Owner: Failed to set the underfrequency protection as specified in Requirement R16; Part 16.1 OR	The Generator Owner did not fulfill the obligations of Requirement R16, Part 16.1 and Part 16.2.

Commenté [BAVL28]: Parts 13.3 and 13.4.

		Coordinator as specified in Requirement R16, Part 16.3.	Failed to set the frequency trip setting upper tolerance as specified in Requirement R16, Part 16.2.	

D. Regional Variances

None.

E. Associated Documents

Technical Rationale

Version History

Version	Date	Action	Change Tracking
1	2-9-2012	Adopted by Board of Trustees	
2	6-23-2015	RSAR Submitted	
2	11-5-2019	Adopted by the NERC Board of Trustees	
2	2-18-2020	FERC issued ~~letter~~ order approving PRC-006-NPCC-2. Docket No. RD20-1-000	

Commenté [GJ29]: Normal phrasing is "FERC order issued approving …"

Standard Attachments

PRC-006-NPCC-2 Attachment A

Compensatory Load Shedding Criteria for Ontario, Quebec, and the Maritime Provinces:

The Planning Coordinator in Ontario, Quebec and the Maritime provinces is responsible for establishing the compensatory load shedding requirements for all existing non-nuclear units in its NPCC area with underfrequency protections set to trip above the appropriate curve in Figure 2. In addition, it is the Planning Coordinator's responsibility to communicate these requirements to the appropriate Distribution Provider or Transmission Owner and to ensure that adequate compensatory load shedding is provided in all UFLS islands in which the unit may operate.

The methodology below provides a set of criteria for the Planning Coordinator to follow for determining compensatory load shedding requirements as part of its UFLS Assessment based on the NERC PRC Standard on UFLS:

Commenté [BAVL30]: "Continent-Wide" seems to be missing.

1. The Planning Coordinator shall identify, compile and maintain a list of all existing non-nuclear generating units in their Planning Coordinator area that were in service prior to the effective date of the regional Standard (July 1, 2015 PRC-006-NPCC-1). The list must indicate generating units, if any, that have their underfrequency protections set to trip above the appropriate curve in Figure 2. Generating Units not appearing on the list as of the effective date of Version 1 of the regional standard, as shown above, must have their Underfrequency protections set to trip on or below the appropriate curve in Figure 2. The list shall include the following information for each unit:

    1.1 Generator name and generating capacity
    1.2 Underfrequency protection trip settings, including frequency trip set points and time delays
    1.3 Physical and electrical location of the unit
    1.4 All islands within which the unit may operate

2. For each generating unit identified in (1) above, the Planning Coordinator shall establish the requirements for compensatory load shedding based on criteria outlined below:

    2.1 Arrange for a Distribution Provider or Transmission Owner that owns UFLS relays within the island(s) identified by the Planning Coordinator within which the generator may operate to provide compensatory load shedding.

    2.2 In Ontario and in the Maritime provinces, the compensatory load shedding that is provided by the Distribution Provider or Transmission Owner shall be in

addition to the amount that the Distribution Provider or Transmission Owner is required to shed as specified in Requirement R4.

2.3 The compensatory load shedding shall be provided at the UFLS program stage (or threshold stage for Quebec) with a frequency threshold setting that corresponds to the highest frequency at which the subject generator will trip above the appropriate curve in Figure 2 during an underfrequency event. If the highest frequency at which the subject generator will trip above the appropriate curve in Figure 2 does not correspond to a specific UFLS program stage threshold setting, the compensatory load shedding shall be provided at the UFLS program stage with a frequency threshold setting that is higher than the highest frequency at which the subject generator will trip above the appropriate curve in Figure 2.

2.4 The amount of compensatory load shedding shall be equivalent (±5%) to the average net generator megawatt output for the prior two calendar years, as specified by the Planning Coordinator, plus expected station loads to be transferred to the system upon loss of the facility. The net generation output should only include those hours when the unit was a net generator to the electric system.

In the specific instance of a generating unit that has been interconnected to the electric system for less than two calendar years, the amount of compensatory load shedding shall be equivalent (±5%) to the maximum claimed seasonal capability of the generator over two calendar years, plus expected station loads to be transferred to the system upon loss of the facility.

Commenté [BAVL31]: Should be R3.

Commenté [BAVL32]: This seems to refer to an old table not anymore present in this version…The parentheses seem to be superfluous

Commenté [GJ33]: Should be aligned with the rest of 2.4

PRC-006-NPCC-2 Attachment B

Compensatory Load Shedding Criteria for ISO-NE and NYISO:

The Generator Owner in the New England states or New York State are responsible for establishing a compensatory load shedding program for all existing non-nuclear units with underfrequency protection set to trip above the appropriate curve in Figure 2 of this standard. The Generator Owner shall follow the methodology below to determine compensatory load shedding requirements:

1. The Generator Owner shall identify, compile, and maintain a list of all of its existing non-nuclear generating units that were in service prior to the effective date of the regional Standard (July 1, 2015 PRC-006-NPCC-1). The list must indicate the Generator Owner's generating units, if any, which have their underfrequency protections set to trip above the appropriate curve in Figure 2. Generating Units not appearing on the list as of the effective date of Version 1 of the regional standard, as shown above, must have their Underfrequency protections set to trip on or below the appropriate curve in Figure 2. The list shall include the following information associated with each unit:

    1.1 Generator name and generating capacity
    1.2 Underfrequency protection trip settings, including frequency trip set points and time delays
    1.3 Physical and electrical location of the unit
    1.4 Smallest island within which the unit may operate as identified by the Planning Coordinator in Requirement R1 of this Standard.

2. For each generating unit identified in (1) above, the Generator Owner shall establish the requirements for compensatory load shedding based on criteria outlined below:

    2.1 In cases where a Distribution Provider or Transmission Owner has coordinated protection settings with the Generator Owner to cause the generator to trip above the appropriate curve in Figure 2, the Distribution Provider or Transmission Owner is responsible to provide the appropriate amount of compensatory load to be shed within the same and smallest island identified by the Planning Coordinator in Requirement R1 of this standard.

    2.2 In cases where a Generator Owner has a generator that cannot physically meet the set points defined by the appropriate curve in Figure 2, the Generator Owner shall arrange for a Distribution Provider or Transmission Owner to provide the appropriate amount of compensatory load to be shed within the same and smallest island identified by the Planning Coordinator in Requirement R1 of this standard.

Commenté [BAVL34]: The word "same" is superfluous because it does not refer to 1.4 above (its intended mission, according to us).

Commenté [GJ35]: It would be preferable to refer to the smallest island listed in the above 1.4 of the Attachment rather than to refer to R1 or the Standard

Commenté [BAVL36]: Same comment as above.

2.3 The compensatory load shedding that is provided by the Distribution Provider or Transmission Owner shall be in addition to the amount that the Distribution Provider or Transmission Owner is required to shed as specified in Requirement R4.

Commenté [BAVL37]: Old reference. Should be R3.

2.4 The compensatory load shedding shall be provided at the UFLS program stage with the frequency threshold setting at or closest to but above the frequency at which the subject generator will trip.

2.5 The amount of compensatory load shedding shall be equivalent (±5%) to the average net generator megawatt output for the prior two calendar years, as specified by the Planning Coordinator, plus expected station loads to be transferred to the system upon loss of the facility. The net generation output should only include those hours when the unit was a net generator to the electric system.

In the specific instance of a generating unit that has been interconnected to the electric system for less than two calendar years, the amount of compensatory load shedding shall be equivalent (±5%) to the maximum claimed seasonal capability of the generator over two calendar years, plus expected station loads to be transferred to the system upon loss of the facility.

PRC-006-NPCC-2 Attachment C

UFLS Table 1: Eastern Interconnection Distribution Providers and Transmission Owners with 100 MW[2] or more of peak net Load shall implement a UFLS program with the following attributes:					
UFLS Stage	Frequency Threshold (Hz)	Minimum Relay Time Delay (s)	Total Nominal Operating Time (s)[1]	Load Shed at Stage as % of TO or DP Load	Cumulative Load Shed as % of TO or DP Load
1	59.5	0.10	0.30	6.5 – 7.5	6.5 – 7.5
2	59.3	0.10	0.30	6.5 – 7.5	13.5 – 14.5
3	59.1	0.10	0.30	6.5 – 7.5	20.5 – 21.5
4	58.9	0.10	0.30	6.5 – 7.5	27.5 – 28.5
5	59.5	0.10	10.0	2 - 3	29.5 – 31.5

UFLS Table 2: Eastern Interconnection Distribution Providers and Transmission Owners with 50 MW[2] or more and less than 100 MW[2] of peak net Load shall implement a UFLS program with the following attributes:					
UFLS Stage	Frequency Threshold (Hz)	Minimum Relay Time Delay (s)	Total Nominal Operating Time (s)[1]	Load Shed at Stage as % of TO or DP Load	Cumulative Load Shed as % of TO or DP Load
1	59.5	0.10	0.30	14 – 25	14 – 25
2	59.1	0.10	0.30	14 – 25	28 – 50

Commenté [BAVL38]: This should be note 1 since it appears first.

1. The total nominal operating time includes the underfrequency relay operating time plus any interposing auxiliary relay operating times, communication times, and the rated breaker interrupting time. The underfrequency relay operating time is measured from the time when frequency passes through the frequency threshold setpoint, using a test rate of frequency decay of 0.2 Hz per second. If the relay operating time is dependent on the rate of frequency decay, the underfrequency relay operating time and any subsequent testing of the UFLS relays shall utilize a test rate of linear frequency decay of 0.2 Hz per second.
2. Peak net load shall be calculated as an average of the peak net load from the previous 3 years, excluding the current year.

UFLS Table 3: Eastern Interconnection Distribution Providers and Transmission Owners with 25 MW[2] or more and less than 50 MW[2] of peak net Load shall implement a UFLS program with the following attributes:					
UFLS Stage	Frequency Threshold (Hz)	Minimum Relay Time Delay (s)	Total Nominal Operating Time (s)[1]	Load Shed at Stage as % of TO or DP Load	Cumulative Load Shed as % of TO or DP Load
1	59.5	0.10	0.30	28 – 50	28 – 50

1. The total nominal operating time includes the underfrequency relay operating time plus any interposing auxiliary relay operating times, communication times, and the rated breaker interrupting time. The underfrequency relay operating time is measured from the time when frequency passes through the frequency threshold setpoint, using a test rate of frequency decay of 0.2 Hz per second. If the relay operating time is dependent on the rate of frequency decay, the underfrequency relay operating time and any subsequent testing of the UFLS relays shall utilize a test rate of linear frequency decay of 0.2 Hz per second.
2. Peak net load shall be calculated as an average of the peak net load from the previous 3 years, excluding the current year.

Rationale Box:

Standard PRC-006-3, R4 requires the Planning Coordinator to conduct a UFLS assessment at least once every five years. However, aside from a UFLS islanding event, it does not prescribe other factors or events which could warrant a new UFLS assessment in less than the five years time-frame.

PRC-006-NPCC-01 contained requirements if changes to load distribution impacted UFLS program performance (R21) but did not consider many other factors. The drafting team recommends retiring these requirements (R21, R22, R23) and replacing them with the following guidance.

Significant variations in the following factors could require a Planning Coordinator to conduct a new assessment:

- Changes to the BES that could modify the creation of islands or the severity of events such as new transmission topologies, revised protection schemes or new or revised RAS.
- Unforeseen islanding event
- Real and reactive load distribution (including changes to location of compensatory load shedding)
- Transmission Owner or Distribution Provider's inability to implement the UFLS program within the stated tolerances
- Load characteristics in particular frequency responsive load
- Automatic load restoration
- Generation geographical distribution
- Generator trip settings
- Generation mix in particular non-BES generation that may not be subject to frequency ride-through criteria
- Generator dynamic modeling
- Dynamic VAR device modeling
- HVDC dynamic modeling

Rationale for Requirement R1: Figure 1 of this document shows the NPCC underfrequency criteria for the Eastern Interconnection portion of NPCC. Figure 1 also shows the NERC criteria as defined in the NERC PRC Standard on UFLS.

Rationale for Requirement R5: An inhibit function provides supervisory control over a UFLS relay. For example, an undervoltage inhibit feature prevents UFLS relay operation if the sensed voltage decreases below an adjustable setting. An undervoltage inhibit function is intended to prevent operation of a UFLS relay when the transmission supply is lost to distribution station feeding many induction motors. Following loss of the transmission supply, motors may support the voltage while the motors coast down in speed. The motors coasting down (ringing down) will look like an underfrequency event to the relay. The inhibit setting is set to a voltage above which the motor load is expected to sustain. This prevents the underfrequency relay from

tripping and locking out distribution feeder breakers supplying the motor load, between the time the transmission supply line trips and the time when the line recloses to restore the load. Voltages sustained by motors that are coasting down (e.g. 0.70 pu) are typically much lower than voltages at which the UFLS relays are required to operate to meet UFLS performance criteria. However, motor loads supplied by cable networks typically have higher ring down voltages because of cable charging. Therefore, care must be taken so that the voltage inhibit setting is not higher than the voltage at which UFLS relays are required to operate to meet UFLS performance criteria.

Rationale for Requirement R9: Ideally, the amount of load to be shed in each stage of the UFLS program for every entity should perfectly match that prescribed in this Standard, for all phases of the load cycle, i.e., seasonal (summer vs. winter), weekly (weekday vs. weekend vs. holidays), daily (morning, noon, and night), etc. for all of the identified islands. Practically, however, this is obviously not possible because the load cycles of the various areas and sub-areas within any given island do not perfectly track the load cycle of the overall island. The UFLS program, on the other hand, is designed based on peak conditions for the overall island. The percentages of actual load shedding that would occur for any conditions other than peak, therefore, can only approximate that prescribed in the Standard. To that end, Requirement R11 requires entities to document measured loads in the UFLS program coincident with their own annual peak, whether or not that peak occurs at the same time or in the same season as the peak of the identified island in which their load resides. Using individual entity peaks vs. overall island peaks provides a consistent approach for accounting purposes among the very entities that are responsible for designing and maintaining their UFLS programs.

Commenté [BAVL39]: Should be R9