ÉTUDES, ANALYSES ET RAPPORTS POUR LA DÉTERMINATION DU FACTEUR X DÉPOSÉS DANS LE CADRE DE L'ÉTABLISSEMENT DU MÉCANISME DE RÉGLEMENTATION INCITATIVE DU DISTRIBUTEUR

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1. DEMANDE DE LA RÉGIE

Dans sa décision D-2017-043[1], la Régie ordonne au Distributeur de déposer, avant le 30 juin 2017, les études, analyses et rapports dont il dispose afin d'éclairer la Régie quant à la détermination du Facteur X en phase 3.

Dans le présent document, le Distributeur expose le cadre d'analyse qui pourra permettre à la Régie d'exercer son jugement afin de fixer un Facteur X qui soit approprié pour le Distributeur.

À la section 2, le Distributeur rappelle les objectifs qu'il s'est donnés en matière d'amélioration de l'efficience et les résultats obtenus depuis 2008.

À la section 3, il présente une analyse sommaire des exercices de balisage effectués depuis 2010 par la firme First Quartile Consulting (First Quartile) sur les activités liées au réseau de distribution et celles liées aux services à la clientèle (SALC).

À la section 4, le Distributeur présente l'analyse de ses experts Concentric Energy Advisors (Concentric) portant sur des études de productivité multifactorielle dans les juridictions nord-américaines pertinentes à l'établissement d'un Facteur X pour le Distributeur.

Sont présentés à l'annexe A, les hyperliens pour accéder aux documents suivants :

- Pièces portant sur l'efficience et la performance du Distributeur déposées de 2007 à 2016 dans le cadre de ses dossiers tarifaires ;
- Pièces portant sur la masse salariale et l'effectif du Distributeur déposées de 2007 à 2016 dans le cadre de ses dossiers tarifaires.

L'analyse de Concentric portant sur des études de productivité multifactorielle dans les juridictions nord-américaines pertinentes à l'établissement du Facteur X pour le Distributeur est présentée à l'annexe B.

L'analyse sommaire présentée au présent document permet de constater la bonne performance du Distributeur en matière d'efficience depuis 2008. Grâce aux importants efforts déployés, les coûts du Distributeur sont maintenant comparables à ceux des autres distributeurs nord-américains, et cela, malgré les facteurs propres au contexte du Distributeur (décrits à la section 3) qui exacerbent les pressions importantes sur ses coûts.

Eu égard à l'appréciation de cette performance, le Distributeur juge cependant nécessaire d'aviser la Régie du fait que, bien qu'il entende poursuivre ses efforts d'efficience, ceux-ci ne sauraient se traduire par des gains de même ampleur que ceux réalisés depuis 2008 (présentés à la section 2.2). D'une part, l'important projet LAD est désormais complété. Or, ce projet structurant est à l'origine d'une part significative des gains constatés durant cette période. D'autre part, le Distributeur se doit de maintenir un budget compatible avec le maintien de la sécurité, de la fiabilité et de la qualité de son service, de même qu'avec son orientation de mieux répondre aux besoins de sa clientèle.

[1] Décision D-2017-043, paragraphe 167.

2. AMÉLIORATION CONTINUE DE L'EFFICIENCE

En continuité avec le travail entrepris au cours des années antérieures, le Distributeur s'est doté en 2008 d'un plan intégré d'amélioration de l'efficience qu'il a présenté dans son dossier tarifaire 2008-2009. Au cours des années qui ont suivi, un état de l'avancement et de l'évolution de son plan intégré d'amélioration de l'efficience a été déposé annuellement dans chacun des dossiers tarifaires aux pièces sur l'efficience et la performance. Ces pièces, dont les hyperliens apparaissent à l'annexe A, font foi des importants efforts d'efficience réalisés.

Globalement, le plan intégré d'amélioration de l'efficience s'articule autour de deux types d'action, soit les actions de gestion courante, qui réfèrent aux améliorations continues des processus et des façons de faire, et les actions structurantes, telles le projet LAD. Ces actions ont été déployées tant dans les activités liées au réseau de distribution que dans celles liées aux SALC. Elles reposent notamment sur l'adoption des meilleures pratiques de l'industrie et sur le recours à des technologies performantes.

2.1. Optimisation de l'effectif

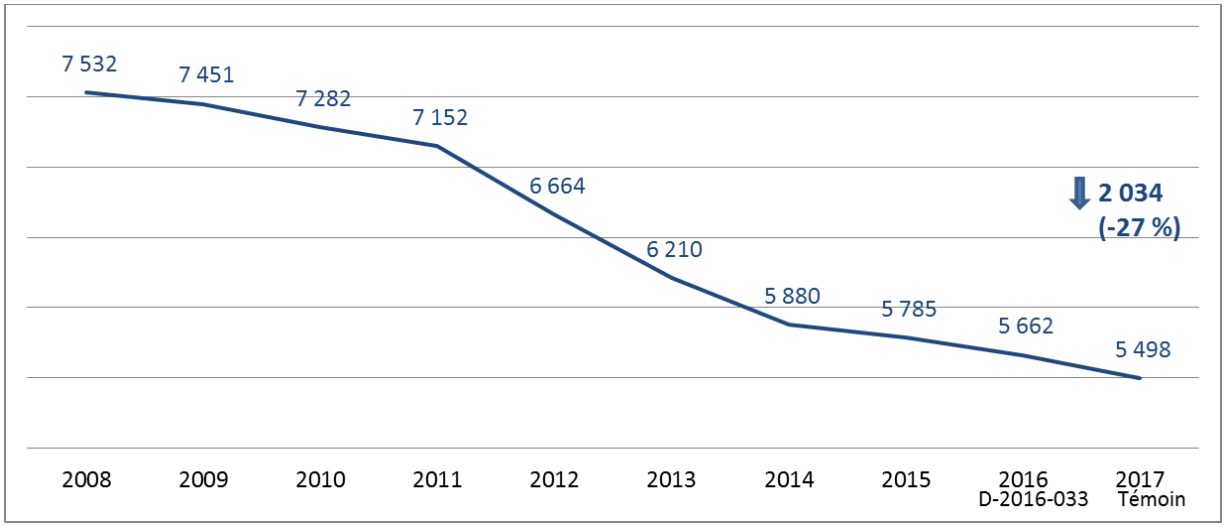
Dans les pièces relatives à la masse salariale et l'effectif (référencées à l'annexe A), le Distributeur fait état des efforts déployés afin d'optimiser son effectif.

Il y est entre autres mentionné que, depuis quelques années déjà, le Distributeur saisit les opportunités offertes par les départs à la retraite pour optimiser son effectif tout en respectant les attentes de ses clients, et ce, à moindre coût.

Ainsi, grâce à ces importants efforts, l'effectif du Distributeur atteint aujourd'hui son plus bas niveau depuis la création de la division. Plus globalement, l'effectif de l'ensemble de l'entreprise est à son plus bas niveau depuis une trentaine d'années, alors que le nombre d'abonnements a augmenté substantiellement au cours de la même période.

Entre 2008 et 2017, les efforts du Distributeur auront permis une réduction de 2 034 postes en équivalent temps complet (ETC), soit une baisse de 27 %, comme l'illustre la figure 1, et ce, sans compromettre la qualité du service.

FIGURE 1 :
RÉDUCTION DE L'EFFECTIF (ETC)



Note : Effectif réel ajusté des réorganisations.

De nouveau, il apparaît nécessaire au Distributeur d'aviser la Régie que le maintien de la tendance observée lui apparaît insoutenable. Ce maintien équivaudrait en effet à anticiper, sur une période équivalente, une suppression d'un peu plus de 2 000 postes supplémentaires, ce qui porterait l'effectif du Distributeur à près de 3 500 à l'horizon de 2024. Or, une telle réduction d'effectif n'est pas envisageable, ne serait-ce qu'en ce qui a trait aux besoins induits par la couverture du large territoire desservi par le Distributeur. De fait, sur la base de son expérience, le Distributeur est déjà à même de constater le défi que représente le maintien d'une qualité de service acceptable avec un effectif de quelque 5 500 ETC.

2.2. Gains d'efficience

L'analyse des pièces sur l'efficience et la performance des dossiers tarifaires (référencées à l'annexe A) permet d'apprécier les efforts entrepris par le Distributeur dans le cadre de son plan intégré d'amélioration de l'efficience. Le tableau 1 présente une synthèse de l'ensemble des gains d'efficience réalisés par le Distributeur depuis l'introduction du plan intégré d'amélioration de l'efficience. Ces gains ont été intégrés dans les tarifs et remis à la clientèle au fil des ans. Ainsi, les gains d'efficience récurrents liés aux améliorations des façons de faire du Distributeur (actions de gestion courante et structurantes) s'élèvent à 432,5 M$ en 2017, soit :

- des gains de gestion courante qui représentent une réduction moyenne annuelle de 3,3 % des charges d'exploitation liées aux activités de base depuis 2008 ;
- des gains structurants, dont 73,9 M$ en lien avec le projet LAD.

TABLEAU 1 :

GAINS D'EFFICIENCE RECONNUS - CHARGES D'EXPLOITATION [2] (M$)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Gains cumulatifs
Actions de gestion courante	**40,0**	**10,5**	**21,7**	**28,4**	**20,8**	**40,8**	**99,8**	**54,4**	**17,5**	**14,4**	**348,3**
Gestion courante	10,0	10,5	13,5	10,9	10,9	10,5	9,8	18,3		14,4	108,8
Efficience additionnelle	30,0					20,3	80,0				130,3
Décisions de la Régie			8,2	17,5	9,9	10,0	10,0	36,1	17,5		109,2
Actions structurantes	**2,8**	**1,1**	**2,7**	**1,4**	**2,3**	**5,0**	**6,4**	**24,0**	**35,8**	**2,7**	**84,2**
Actions structurantes	2,8	1,1	2,7	1,4	2,3	5,0	6,4	20,1	35,8	2,7	80,3
Décisions de la Régie								3,9			3,9
Gains annuels	**42,8**	**11,6**	**24,4**	**29,8**	**23,1**	**45,8**	**106,2**	**78,4**	**53,3**	**17,1**	
Efforts des années antérieures		**42,8**	**54,4**	**78,8**	**108,6**	**131,7**	**177,5**	**283,7**	**362,1**	**415,4**	
Gains cumulatifs	**42,8**	**54,4**	**78,8**	**108,6**	**131,7**	**177,5**	**283,7**	**362,1**	**415,4**	**432,5**	

Outre les gains découlant des actions structurantes, la tendance montre un ralentissement des gains constaté dans les années 2016 et 2017, ce qui suggère un essoufflement dans les efforts de gestion courante dans un contexte d'amélioration de la qualité du service.

2.3. Évolution des coûts du Distributeur

Dans le cadre de son plan intégré d'amélioration de l'efficience, le Distributeur s'est donné comme objectif de contenir sous l'inflation[3] la croissance annuelle moyenne de huit indicateurs d'efficience sur une période mobile de cinq ans, tout en fournissant à sa clientèle une alimentation électrique fiable, ainsi que des services à la clientèle de qualité et faciles d'accès.

Le tableau 2 présente, pour la période 2008-2017, les huit indicateurs d'efficience internes qui permettent au Distributeur de rendre compte de sa performance sur le plan des coûts. Ces indicateurs d'efficience du Distributeur sont plus amplement décrits et analysés aux pièces des dossiers tarifaires sur l'efficience et la performance (référencées à l'annexe A).

TABLEAU 2 :

INDICATEURS D'EFFICIENCE PRIVILÉGIÉS PAR LE DISTRIBUTEUR

Description	Années historiques								D-2016-033	Année témoin	Variation moyenne
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2008-2017
Indicateurs globaux du Distributeur											
1 - Coût total Distribution et SALC ($) par abonnement	554	532	566	553	539	512	520	527	500	493	-1,3%
2 - Coût total Distribution et SALC (¢) par kWh normalisé	1,27	1,27	1,33	1,31	1,29	1,24	1,27	1,32	1,24	1,25	-0,2%
3 - CEN Distribution et SALC ($) par abonnement	290	285	302	287	282	266	260	268	268	266	-1,0%
4 - IEN ($) par abonnement	2 195	2 192	2 166	2 151	2 133	2 155	2 182	2 224	2 203	2 218	0,1%
Indicateurs processus SALC											
5 - Coût total SALC ($) par abonnement	114	104	105	101	100	99	112	111	95	98	-1,7%
6 - CEN SALC ($) par abonnement	106	101	111	97	94	89	96	95	92	92	-1,6%
Indicateurs processus Distribution											
7 - Coût total Distribution ($) par abonnement	435	446	453	449	439	412	408	416	405	395	-1,1%
8 - CEN Distribution ($) par abonnement	180	186	189	188	188	176	164	173	176	174	-0,4%
Taux d'inflation	2,3%	0,3%	1,8%	2,9%	1,5%	0,9%	2,0%	1,1%	1,4%	1,8%	1,5%

* Les données sont présentées telles que diffusées au travers le temps, sans tenir compte des ajustements organisationnels et autres changements.

Sur la période 2008-2017, les huit indicateurs affichent une décroissance annuelle moyenne, ou une croissance à peu près nulle, alors que l'inflation s'établit en moyenne à 1,5 %

[2] Dossier R-3980-2016, pièce HQD-2, document 1 (B-0013), page 9.
[3] IPC du Canada.

annuellement. Au cours des dix dernières années, le Distributeur est ainsi parvenu à offrir un service de qualité à ses clients tout en absorbant la pression exercée par l'inflation sur ses propres coûts.

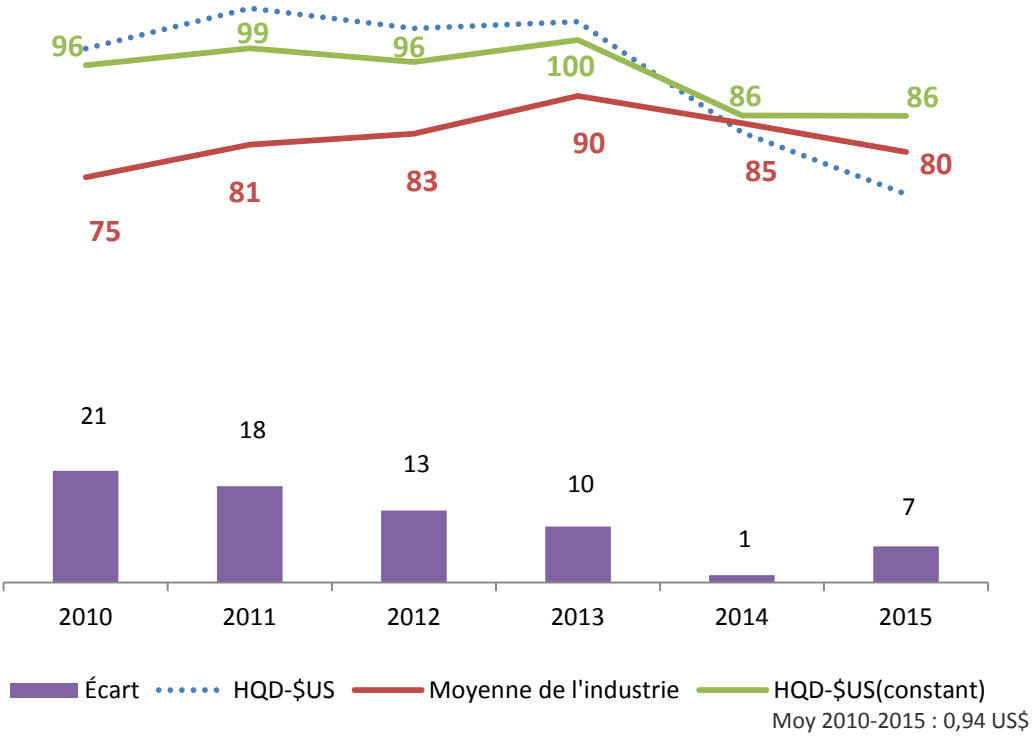
Le Distributeur est d'avis que son objectif de contenir sous l'inflation la croissance annuelle moyenne de ses huit indicateurs d'efficience sur une période mobile de cinq ans sera un défi de taille pour les années à venir.

3. BALISAGE

Les résultats du balisage de First Quartile présentés dans cette section témoignent aussi des efforts d'efficience du Distributeur réalisés au cours des dernières années. Ces résultats permettent également de constater, dans le cas du Distributeur, une stabilisation de la tendance à la baisse des dépenses d'exploitation liées au réseau de distribution et aux services à la clientèle.

Le balisage effectué par First Quartile montre que les dépenses d'exploitation pour le réseau de distribution et pour les SALC du Distributeur sont comparables à celles des autres distributeurs nord-américains, lorsque les spécificités du Distributeur sont prises en compte.

FIGURE 2 :
DÉPENSES D'EXPLOITATION POUR LE RÉSEAU DE DISTRIBUTION PAR ABONNEMENT ($US)



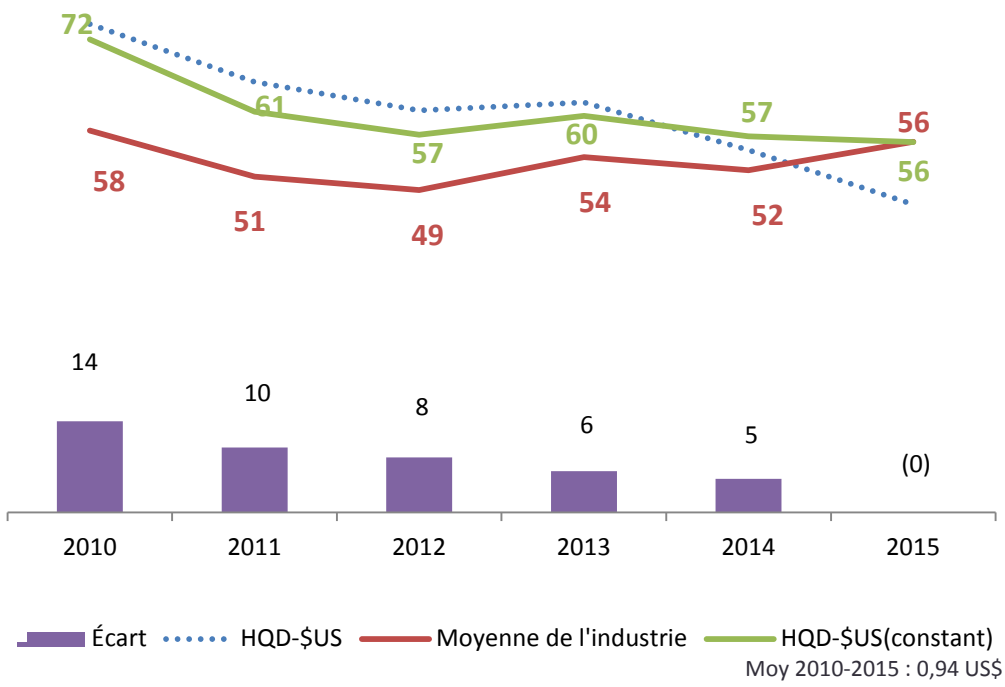
Comme l'illustre la figure 2, les dépenses d'exploitation du Distributeur pour son réseau ont été historiquement plus élevées que celles des autres distributeurs, en raison notamment des éléments suivants :

- un réseau très étendu ;
- une plus faible densité de population ;
- un important ratio rural / urbain ;
- certaines contraintes climatiques particulières.

Le Distributeur souligne toutefois que ses efforts d'efficience portent fruit, car l'écart par rapport à la moyenne des distributeurs est en diminution constante de 2010 à 2014, à taux de change constant.

En 2015, le coût par abonnement du Distributeur est demeuré stable.

FIGURE 3 :
DÉPENSES D'EXPLOITATION POUR LES SALC PAR ABONNEMENT ($US)



Tout comme pour les dépenses d'exploitation relatives à son réseau, les dépenses d'exploitation du Distributeur pour ses SALC sont historiquement plus élevées que celles des autres distributeurs. Plusieurs facteurs peuvent expliquer cette situation. Entre autres, le

Distributeur reçoit un volume d'appels proportionnellement plus important que ses pairs, notamment en raison du fait que ses clients ont moins recours aux autres canaux de communication (par exemple Internet) que les clients des distributeurs de comparaison.

Par ailleurs, pour répondre à son rôle social et en matière de développement économique, le Distributeur doit maintenir une douzaine de sites en région pour son centre d'appels, alors que les autres distributeurs n'en ont, règle générale, qu'un ou deux.

Toutefois, malgré toutes ces contraintes et comme l'illustre la figure 3, les efforts d'efficience du Distributeur au cours des dernières années ont eu pour effet de rapprocher les dépenses d'exploitation par abonnement pour ses services à la clientèle de celles des distributeurs de comparaison. De plus, tandis que les dépenses des distributeurs de comparaison ont augmenté en 2015, celles du Distributeur poursuivent leur tendance à la baisse, mais de façon moins marquée qu'en 2014.

4. ÉTUDES DE PRODUCTIVITÉ MULTIFACTORIELLE DANS LES JURIDICTIONS NORD-AMÉRICAINES

Le Distributeur a retenu les services d'experts de Concentric pour identifier et analyser les études de productivité multifactorielle pertinentes à l'établissement d'un Facteur X pour le Distributeur dans le cadre de son MRI. Les constatations préliminaires de Concentric sont présentées à l'annexe B.

Il appert de cette analyse que, outre les études de productivité déjà identifiées en phase 1[4], qui présentaient un large éventail de taux de productivité pour les distributeurs d'électricité et de gaz en Amérique du Nord, les facteurs de productivité sont généralement à la baisse, passant même au négatif, selon les nouvelles études menées en Alberta et en Ontario.

5. CONCLUSION

À la lumière des études, analyses et rapports présentés dans le présent document, il est possible de tirer les conclusions préliminaires suivantes :

- Le Distributeur a dégagé des gains d'efficience à un rythme soutenu depuis 2008 dans ses activités de base ainsi que grâce au projet structurant d'implantation de l'infrastructure de mesurage avancé. Cependant, ce rythme ne saura être maintenu dans les prochaines années considérant, d'une part, que le projet d'implantation de l'infrastructure de mesurage avancé est complété et, d'autre part, que le Distributeur se doit de maintenir un budget compatible avec le maintien de la sécurité, de la fiabilité et de la qualité de son service, de même qu'avec son orientation de mieux répondre aux besoins de sa clientèle. La détermination du Facteur X, notamment en

[4] Dossier R-3897-2014, réponse à la question 4.2 à la demande de renseignements n^{o} 1 de la Régie, à la pièce HQTD-4, document 1 (C-HQT-HQD-0045).

ce qui a trait à la composante du *stretch factor* devra se faire en considérant les efforts d'efficience importants déjà réalisés.

- Les études de productivité plus récentes tenant compte d'un contexte d'affaires plus contemporain et démontrant des taux de productivité à la baisse, examinées dans le cadre des mécanismes de réglementation des compagnies d'électricité nord-américaines, devraient être considérées dans l'établissement du Facteur X du Distributeur.

Dans le cadre de la phase 3B de l'établissement de son MRI, le Distributeur procédera à la mise à jour des études, analyses et rapports existants, le cas échéant, et présentera son positionnement quant à la détermination du Facteur X à utiliser pour son MRI.

ANNEXE A :

RÉFÉRENCES (HYPERLIENS) AUX DOCUMENTS DU DISTRIBUTEUR

Documents sur l'efficience et performance

- R-3644-2007 - Efficience et performance
- R-3677-2008 - Efficience et performance
- R-3708-2009 - Efficience et performance
- R-3740-2010 - Efficience et performance
- R-3776-2011 - Efficience et performance
- R-3776-2011 - Efficience et performance (révision)
- R-3814-2012 - Efficience et performance
- R-3854-2013 - Efficience et performance
- R-3854-2013 - Efficience et performance (révision)
- R-3905-2014 - Efficience et performance
- R-3933-2015 - Efficience et performance
- R-3980-2016 - Efficience et performance

Documents sur la masse salariale et l'effectif

- R-3644-2007 - Masse salariale et effectifs
- R-3677-2008 - Masse salariale et effectifs
- R-3708-2009 - Masse salariale et effectifs
- R-3710-2010 - Masse salariale et effectifs
- R-3776-2011 - Masse salariale et effectifs
- R-3814-2012 - Masse salariale et effectifs
- R-3814-2012 - Masse salariale et effectifs (révision)
- R-3814-2012 - Masse salariale et effectifs (complément)
- R-3854-2013 - Masse salariale et effectifs
- R-3905-2014 - Masse salariale et effectifs
- R-3933-2015 - Masse salariale et effectifs
- R-3980-2016 - Masse salariale et effectifs

ANNEXE B :

RAPPORT DE CONCENTRIC

PERFORMANCE BASED REGULATION:

PRODUCTIVITY FACTOR FOR HQD

PREPARED FOR:
HYDRO-QUÉBEC DISTRIBUTION

R-3897-2014

BEFORE THE: RÉGIE DE L'ÉNERGIE

JUNE 30, 2017

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Section 1:
Introduction

The Régie determined in D-2017-043 that it would rely on its informed judgment in determining an appropriate productivity factor for HQD in Phase III of this proceeding.[1] To inform its judgment, the Régie has requested that the Distributor file all studies, analyses, and reports available to it by June 30, 2017.[2] There are multiple methodologies to help inform X, ranging from observing past productivity gains to industry benchmarking studies to complex productivity studies. This Memorandum provides an update to X factor research submitted in Phase 1 of the HQD MRI proceeding, and other information that may support the Régie's determination of HQD's recommended X factor.

Concentric's original X-factor research was provided in response to the Régie's information request R4.2 (and in Attachment B, HQTD-4, Document 1.1). As illustrated then, experts have estimated a wide range of X factors for electric and gas distributors in recent years. In this update to this research, that variability remains evident. We also observe that the trend in utility industry productivity is declining over time, as evidenced by trends in the most recent studies and resulting MRI plans.

[1] D-2017-043, R-3897-2014 Phase 1, at ¶ 162.
[2] D-2017-043, R-3897-2014 Phase 1, at ¶ 167.

Section 2:
Updated X-Factor Research

Since Concentric's initial research provided to the Régie was prepared in February 2016, productivity studies have been presented in Alberta and Ontario, as summarized below.

Alberta

The current MRI plans for Alberta's electric and gas distributors expire on December 31, 2017. The Commission initiated a proceeding to establish the "next generation of PBR plans" to be implemented for the 2018-2022 period in May 2015. Plan proposals, including recommended X-factors, were submitted in March 2016 and the Commission issued its decision in December 2016. Several experts provided productivity related evidence and studies, including: The Brattle Group ("Brattle"), Christensen Associates ("Christensen"), Pacific Economics Group ("PEG"), PCMG Associates ("PCMG")[3] and other individual experts.[4] Brattle and Christensen submitted evidence on behalf of the utilities, while PEG and PCMP submitted evidence on behalf of intervenors.

In its Decision, the Commission reduced the X-factor to 0.3% from the 1.16% (TFP growth of 0.96% plus a stretch factor of 0.2%) adopted in 2012 for the prior plans. This current Decision is primarily based on three studies submitted in the proceeding, from Brattle, Christensen, and PEG as highlighted in Table 1. Each of the three studies produced results lower than the 0.96% adopted by the Commission in 2012. The AUC noted:

> The three studies filed in this proceeding provide a relatively wide range of TFP growth values, with all final recommendations smaller than, and in some cases much smaller than, the TFP growth number adopted by the Commission in Decision 2012-237. The issue that the Commission must address, therefore, assuming the Commission finds any of the studies to be acceptable, is not whether the TFP growth component of 0.96 per cent adopted in Decision 2012- 237 needs to be lowered for the next generation PBR plans, but rather the extent to which it needs to be lowered.[5]

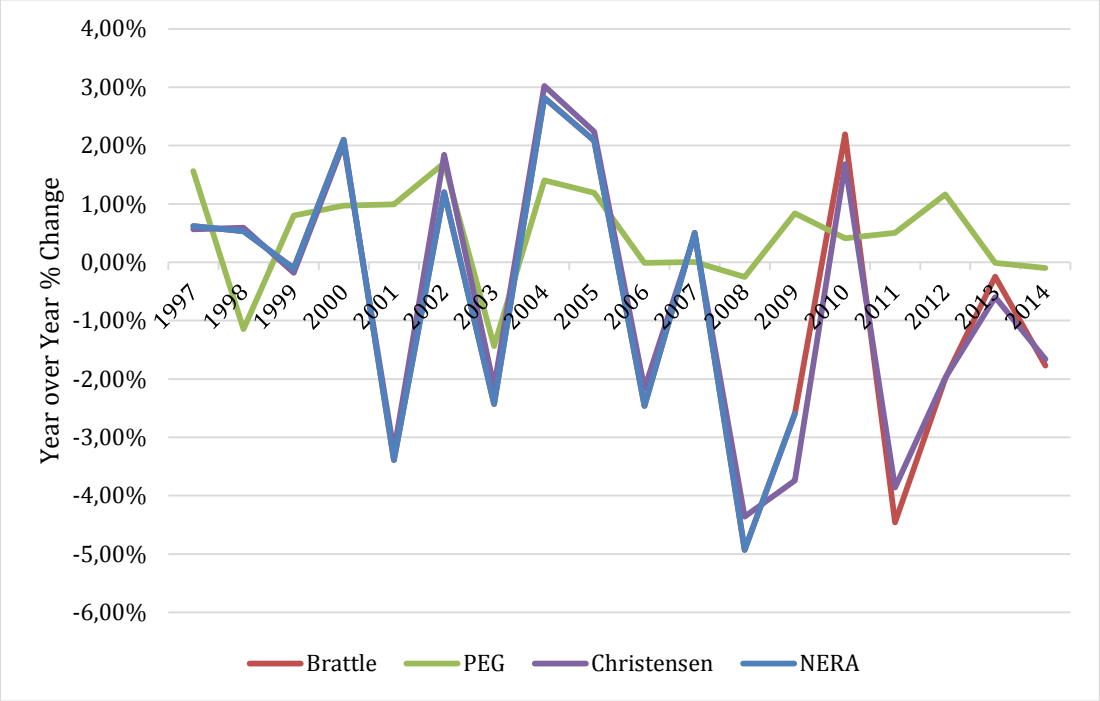
[3] PCMG submitted evidence but did not undertake a TFP or MFP study.
[4] AUC Decision 20414-D01-2016, December 16, 2016, at 1-3.
[5] AUC Decision 20414-D01-2016, December 16, 2016, at 24.

Table 1: 2016 Alberta Productivity Studies

Expert	*Participant*	*TFP Study Results*	*Proposed X Factor (%)*	*Sample / Time Period*
Brattle (Brown and Carpenter)	Distribution Utilities (other than EPCOR)	-0.37% to -1.37%	-0.79%	67 utilities, 2000-2014
Christensen Associates (Meitzen)	EPCOR	-1.11%	-1.11%	68-72, Average of last 15 (2000-2014) and last 10 (2005-2014) years
PEG (Lowry)	CCA	0.36% to 1.03%	0.43% 0.78%	88, 21, 1997-2014
Final Commission Decision			0.3%	

The annual productivity estimates from these studies, as well as the 2012 NERA study upon which the 2012 AUC decision was based, are illustrated in Figure 1. The calculation of total factor productivity growth is based on the difference between measured outputs (MWHs or customers) and inputs (labor, capital, and other). Both outputs and inputs vary by year, and taking the difference between the two indices creates a volatile year-to-year profile, so the data is typically compiled over many years to reflect the industry trend. All the studies show an industry trend in productivity converging at or below zero over this two-decade period, indicating negative productivity growth. This does not mean the utilities in the sample are becoming less productive, per se, but that the rate of growth of inputs is exceeding the rate of growth in output. A contributing factor has been the decline in electric demand growth without offsetting declines in labor, capital and other operational costs required to maintain and upgrade these utility systems.

Figure 2: Productivity Study Results Submitted in Alberta



The AUC indicated that it considered several factors in its assessment of each study, including: objectivity; consistency and transparency of the three studies; the utility data set employed in each study; the calculation methods and assumptions; the output measures; and the time periods of each study.[6] The AUC also offered insight into its previous decision in the 2012 generic proceeding,[7] noting:

> Although NERA's was not the only TFP growth study considered in that proceeding, the Commission found the NERA study to be preferable because of the "objectivity and transparency of the data and of the methodology used, the use of data over the longest time period available and the broad based inclusion of electric distribution utilities from the United States." The final approved TFP growth value of 0.96 per cent, determined as the difference between growth in output and growth in inputs, was obtained as the average of 37 annual TFP growth values for the 1972-2009 period…[8]

The AUC discussed the value of, and the differences in, transparency, objectivity, and consistency of the studies. It considered the considerable differences between the utility studies and the study performed by PEG, but ultimately chose to give all studies the same weight with regard to these factors.

[6] AUC Decision 20414-D01-2016, December 16, 2016, at 45.
[7] Alberta 2012 Generic PBR Proceeding resulted in Decision 2012-237, September 12 ,2012.
[8] AUC Decision 20414-D01-2016, December 16, 2016, at 22-23.

The AUC noted that in its judgment, "[T]he issue of whether the TFP growth value should be determined based on a customization or tailoring of firms selected to be included within the TFP growth study based on characteristics similar to the Alberta distribution utilities is directly related to the underlying objectives of a PBR plan." Ultimately, the Commission decided that since PBR in Alberta is meant to emulate competitive markets, it is preferable to use a broad sample that will represent the many factors that influence productivity in a market.[9]

Responding to varying input and output measures used in the studies, the AUC noted it was unwilling to state a preference for the set of assumptions used by any one TFP study over another. Underscoring the challenges of interpreting the results of TFP studies from alternative experts with varying assumptions and methods, the Commission noted:

> In the Commission's view, there is no overwhelming new evidence in this proceeding that any of these assumptions are correct or incorrect. The assumptions chosen reflect the practitioner's decisions and beliefs based on the available choices that can be applied to the data, and there is generally no test presented in evidence that can be applied to determine which assumptions are more applicable to particular data or the purposes for which it is used. It is unlikely that any group of unassociated practitioners will make the same choices for all the assumptions, even with the same universe of data series available to them. For this aspect of the analysis, the Commission is, therefore, unwilling to specify a preference for the set of assumptions used by any particular one of the three TFP growth studies.[10]

However, the AUC acknowledged that with the prevalence of both fixed and variable revenue components for distribution utilities, the number of customers (the output measure used by PEG) is a relevant output measure along with volume (the output measure used by Brattle and Christensen), where the relative weights assigned to these two output measures would ideally reflect the proportion of revenues generated through fixed versus variable (volumetric) charges.[11]

The time period of each study was the last major consideration of the AUC in determining the X factor. Brattle and Christensen each highlighted the evolution of productivity results over time and argued that more weight should be given to results from more recent years. The Commission decided that the time period used remains an "open question."[12]

Expressing its view on the range of results from alternative studies, the Commission ultimately concluded:

> [T]he Commission views the variety of results that have been provided as confirming that the TFP growth value is likely not a correct single number, but that a reasonable value likely falls within a range of values, demarcated by the breadth of assumptions and data sets that may be reasonably employed in producing the studies.[13]

[9] AUC Decision 20414-D01-2016, December 16, 2016, at 28.
[10] AUC Decision 20414-D01-2016, December 16, 2016, at 30.
[11] AUC Decision 20414-D01-2016, December 16, 2016, at 30-33.
[12] AUC Decision 20414-D01-2016, December 16, 2016, at 36.
[13] AUC Decision 20414-D01-2016, December 16, 2016, at 40.

The Commission's conclusion is consistent with Concentric's observations regarding the estimation of utility productivity. In reaching its final determination of the appropriate X factor, the AUC reasoned:

> The Commission has determined an X factor, using its judgement and expertise in weighing the evidence and in taking into account the multitude of considerations set out above, in particular evidence demonstrating that the TFP growth value cannot with certainty be identified as a single number, but rather, in view of the variability resulting from the assumptions employed, must be considered as falling within a reasonable range of values, between -0.79 and +0.75. The Commission finds that a reasonable X factor for the next generation PBR plans for electric and gas distribution utilities in Alberta, inclusive of a stretch factor, will be 0.3 per cent.[14]

Ontario

Ontario's electric distributors are operating under the Ontario Energy Board's ("OEB's") 4th generation performance based ratemaking plans. Since Concentric provided its initial research to the Régie, Hydro One, the province's largest electric distributor, has submitted a proposal for a five-year rate plan, covering the 2018-2022 rate period. The company's proposal is supported by a productivity study conducted by Power System Engineering ("PSE"). The study incorporates estimates of productivity for Hydro One, covering the 2002-2015 period, and an estimate based on updates to a study previously performed by PEG, the Board's consultant, for the entire Ontario electric industry. The updates by PSE added data for 2013, 2014 and 2015 to the 2002-2012 period previously analyzed.[15] These results are presented in Table *2*.

[14] AUC Decision 20414-D01-2016, December 16, 2016, at 45.
[15] EB-2017-0049 – Hydro One Networks Inc.'s 2018-2022 Distribution Custom IR Application and Evidence Filing, March 31, 2017, Exhibit A, Tab 3, Schedule 1, p. 6; and Exhibit A-3-2, Attachment 1, Total Factor Productivity Study of the Electric Distribution Functions of Hydro One and the Ontario Industry, Power System Engineering, Inc., November 4, 2016, at 1.

Table 2: Productivity Study Results Submitted by Hydro One

Expert	*Participant*	*TFP Study Results*	*Proposed X Factor (%)*	*Stretch Factor (%)*	*Sample / Time Period*
Power System Engineering	Hydro One Distribution	Hydro One TFP Unadjusted: -1.4% Adjusted: -0.9% Ontario Industry TFP (PEG Update): -0.9%	0.0%	0.6%	2002-2015, Hydro One TFP: 1 firm PEG Update: 73 firms

PSE did not recommend an X Factor based on Hydro One's productivity trend, but rather based on the Ontario trend consistent with the prior Board Decision on this matter. PSE explains:

> During the 4th Generation Incentive Regulation proceeding (EB-2010-0379), PEG conducted a TFP study for the Ontario electric distribution study (PEG Study). The study objective, as PSE understands it, was to provide an empirically-based recommendation on the productivity factor. This focused objective did not include an evaluation of the performance trend of individual distributors. Rather, the study was meant to inform the Board regarding the most appropriate productivity factor.
>
> The PEG study determined the Ontario electric distribution TFP for 2002 to 2012 was -0.3%. Since the time of that study, industry data has become available for the years 2013, 2014, and 2015. PSE has replicated PEG's methodology for the 2002 and 2012 period and updated the Ontario industry TFP study to 2015.
>
> The updated average annual growth rate in the Ontario TFP is -0.9%. Consistent with the prior study, this excludes Hydro One and Toronto Hydro.[16]

PSE's report, incorporated in the Hydro One filing, presented the following conclusions:

> After updating the Ontario industry TFP to 2015, PSE found the 2002-2015 trend is -0.9%. The 2002-2012 Ontario TFP trend was -0.3%. Based on the empirical evidence of declining industry TFP and the OEB's 4th Generation IR decision to set the productivity factor at 0.0%, PSE recommends setting Hydro One's productivity factor no higher than 0.0%.

[16] EB-2017-0049 – Hydro One Networks Inc.'s 2018-2022 Distribution Custom IR Application and Evidence Filing, March 31, 2017, Exhibit A, Tab 3, Schedule 1, p. 6; and Exhibit A-3-2, Attachment 1, Total Factor Productivity Study of the Electric Distribution Functions of Hydro One and the Ontario Industry, Power System Engineering, Inc., November 4, 2016, at 4.

The X-factor is calculated as the sum of the productivity factor and the stretch factor. Stretch factors are normally determined using benchmarking research. PSE is of the opinion that accurate total cost benchmarking is the best approach in setting stretch factors. The long term 2002-2015 Hydro One adjusted TFP trend of -0.9% and the recent positive TFP growth of +0.5% provides evidence that there is the chance for modest TFP growth in the near term. On this basis, PSE recommends setting the stretch factor no higher than 0.6%. This is the maximum stretch factor put forth in 4th Generation IR and combined with a 0.0% productivity factor would amount to an X-factor of 0.6%.[17]

[17] EB-2017-0049 – Hydro One Networks Inc.'s 2018-2022 Distribution Custom IR Application and Evidence Filing, March 31, 2017, Exhibit A, Tab 3, Schedule 1, p. 6; and Exhibit A-3-2, Attachment 1, Total Factor Productivity Study of the Electric Distribution Functions of Hydro One and the Ontario Industry, Power System Engineering, Inc., November 4, 2016, at 5-6.

Section 3:
Decline In X Factors Over Time

The AUC's decision to lower the X factor from 1.16 to 0.3 was informed by lower study results compared those submitted in its 2012 proceeding. The PSE study submitted in Ontario documents a similar trend. The experts cite several factors underscoring the decline in industry productivity.

Brattle:

Brattle noted that the lower productivity results in recent years could be the result of a shift in the utility industry. Brattle stated:

> The key question is whether the TFP results from more recent years are different from the TFP results in older years, for example because the structure of the industry has changed, because the older data is unreliable or inconsistently measured, or for some other reason.
> …
> The TFP results from the last five years are not consistent with an estimate based on the period 1972–2009. One possible explanation for this is that, as discussed above, the structure of the utility industry in the US was significantly different in the earlier than the later parts of the period.[18]

Christensen:

Christensen presented results showing a negative trend in TFP growth that has continued and has accelerated. They reason that "[t]he decline in TFP growth has been largely driven by a decline in output growth and that trend has continued, and has even accelerated, into the 2009- 2014 period as output growth substantially diminished from its 0.69 percent annual average over the 1999-2009 period to an annual average growth of 0.16 percent over the 2009-2014 period. In contrast, input growth has remained relatively constant and actually increased somewhat in the 2009-2014 period."[19]

Christensen went on to note independent research that finds that a reduction in output growth is the result of a change in the relationship between economic activity and electricity use:

> Independent research published in the Electricity Journal finds that this reduction in output growth can be explained by a change in the long-term relationship between growth in economic activity and electricity use. Since the 1970s, electricity use and GDP had grown at comparable rates. However, the ratio of electricity consumption to GDP has been on a downward trend since the mid-1990s and, since 2007, the

[18] Brattle Written Evidence, Proceeding No. 20414, March 23, 2016, at 33.
[19] Meitzen, Mark E. Christensen Associates. *Determination of the Second-Generation X Factor for the AUC Price Cap Plan for Alberta Electric Distribution Companies.* March 21, 2016, at Appendix B of EDTI Application, at 20-23.

> economy has generated GDP growth with almost no net growth in electricity demand.[20]
>
> The TFP data presented here reflects the findings of this research as it shows lower TFP growth resulting from the noted reduction in electricity consumption growth and, consequently, lower output growth. As shown in Table 2, over the period 1996 to 2014, output grew at an annual rate of 0.75 percent, input grew at an annual rate of 1.39 percent, and TFP grew at an annual rate of -0.64 percent. This is in contrast to much higher average TFP growth in the 1972-1996 period, which was largely driven by significantly greater output growth. During the 1972-1996 period, output growth averaged 2.70 percent, input growth averaged 0.98 percent, and TFP growth averaged 1.72 percent. Finally, coincident with the flat electricity consumption noted over the 2007-2014 period, output growth dropped sharply to an annual average rate of -0.72 percent, input grew at an annual rate of 1.35 percent, and TFP grew at an annual rate of -2.07 percent.
> …
> Consistent with the independent research cited, it is clear from Figure 1A that the primary driver of the reduction in TFP growth to its current negative state has been negative output growth.[21]

PEG:

PEG did not update the 2012 NERA study but instead conducted a new study with different output measures. The slowdown in productivity in recent years was less evident in these study results. PEG noted "[t]hus, there was not a material slowdown in the multifactor cost efficiency trend."[22]

PSE:

PSE recognized the declining trend in productivity in its study for Hydro One. It interpreted these results with the following assessment:

> The Board requested Hydro One measure its own TFP trend to demonstrate improvement in productivity. Changes in TFP will have tangible impacts on distributor costs and the value provided to consumers. A potential explanation for a changing TFP trend is a change in the underlying performance and efficiency of the distributor. PSE's research measuring Hydro One's adjusted TFP is an effort to quantify and demonstrate Hydro One's comprehensive performance trend over time.
>
> Notwithstanding our best efforts to measure Hydro One's performance trend through TFP research, PSE provides some caveats and urges a degree of caution in

[20] Richard F. Hirsh and Jonathan G. Koomey, "Electricity Consumption and Economic Growth: A New Relationship with Significant Consequences?" The Electricity Journal, November 2015, Vol. 28, Issue 9, at 75.
[21] Meitzen, Mark E. Christensen Associates. Determination of the Second-Generation X Factor for the AUC Price Cap Plan for Alberta Electric Distribution Companies. March 21, 2016, at Appendix B of EDTI Application, at 20-23.
[22] Lowry, Mark Newton. Pacific Economics Group. Next Generation PBR for Alberta Energy Distributors. March 23, 2016, at 66.

the interpretation of both Hydro One's 2002-2015 negative TFP growth rate of 0.9% and the 2010-2015 positive growth rate of 0.5%. While these are important measures of performance, we discuss below some considerations for not automatically assuming the TFP trends are unconditionally indicative of changing performance and efficiency.

For both Hydro One and the Ontario industry, there are years and time periods that show negative TFP trends. The OEB addressed this possibility in the Board's Decision dated November 21, 2013 in EB-2010-0379 (page 17).

The Board acknowledges that achieved industry TFP may be negative due to unforeseen events and/or situations in which costs may be incurred with no corresponding increase in output.

TFP is a measure of the change in the outputs delivered by the utility (or industry) relative to the inputs required to deliver those outputs. However, it is important to note that a negative TFP growth rate does not necessarily indicate declining efficiency at either the industry or the utility level. Recall that the TFP trend equals the Output Quantity Index trend minus the Input Quantity Index trend. Negative TFP trends do indicate that measured outputs are growing slower than inputs.

While declining efficiency is certainly one possibility for observing negative TFP trends, there are a number of other possibilities. Given the presence of incentive regulation, it seems unlikely that efficiency is declining across the entire industry. Other systemic possibilities include:

1. The increasing of "outputs" that are not being measured within the TFP calculation. PSE attempts to partially solve this issue with the performance adjustments found in this study. As applied to Hydro One, we see that the long-term trend for Hydro One goes from slightly negative to slightly positive after incorporating and adjusting for the valued services of reliability and employee safety. While PSE's performance adjustments (discussed in the following section) attempt to quantify these performance outputs, there are other valued utility functions that are difficult, if not impossible, to incorporate and quantify. These other valued functions could include customer service activities, meeting increased regulatory requirements, providing enhanced environmental stewardship, and increasing other aspects of power quality.
2. External circumstances can change over time. One of these circumstances often found in modern western economies is slower growth. Output growth has slowed due to more energy efficient appliances and machinery and conservation programs. This has slowed both the total amount of energy delivered (in kWh) and peak demands (in kW). The growth in customers, especially in more rural areas, has also slowed. Since the TFP trend is a function of the output index, this slower growth will tend to slow down TFP from historical norms.
3. A common external circumstance that is changing across the electric industry, but is problematic to quantify, is the aging of capital infrastructure. Due to the post World War II population boom and increasing use per customer during that time, utilities needed to heavily invest in capital infrastructure to meet the higher number of customers and peak demands (unlike today they were able to

fund much of this investment through increasing billing determinants rather than higher prices). At a number of utilities throughout North America a high proportion of capital infrastructure is now past its useful life and is in need of replacement. However, capital expenditures may need to increase to replace this capital. Additionally, maintenance costs will also tend to increase as the grid becomes older. The capital replacement expenditures and increasing maintenance costs will tend to cause a decline in TFP.

Unfortunately, it is impossible to empirically adjust for all of the underlying causes of observed TFP trends. PSE addressed the safety and reliability metrics in an effort to move the TFP trends closer to being true measures of performance. Incorporating these metrics had the effect of improving Hydro One's TFP trend. There are still other unmeasured outputs, changing circumstances, and aging infrastructure that are not incorporated in the TFP measure. Yet, TFP measures are useful indicators of performance assuming these other considerations are kept in mind.[23]

Canadian and U.S Trends in Productivity

The Canadian and U.S. governments also track trends in productivity. In Canada, trends are tracked for the broader business sector, and specific to utilities. In the U.S., a utility specific measure is not available, but the broader business sector is tracked. The data in Table 3 show what has historically been a productivity differential between the Canadian and U.S. business sectors that has narrowed over the past several years, with overall business productivity at 0.4 and 0.5% respectively. The Canadian business sector has actually seen an increase in productivity in the near-term compared to the longer-term average. As seen in the evidence submitted in the Alberta and Ontario evidence, the pattern of declining productivity growth in the utility sector has been exhibited more broadly across the Canadian utility sector, as illustrated in the multifactor productivity data provided by Statistics Canada. The longer term utility productivity growth of -1.1% declined to -2.1% over the most recent five year period.

[23] PSE Report filed with Hydro One Application, at 12-13.

Table 3: Canada and US Multifactor Productivity Trends

	Statistics Canada[24]	Statistics Canada[25]	Bureau of Labor Statistics[26]
	Utility Sector Multifactor Productivity	Business Sector Multifactor Productivity	Non-Farm Private Business Multifactor Productivity
2000	2.4%	2.1%	1.6%
2001	-7.9%	0.1%	0.5%
2002	7.8%	1.3%	2.2%
2003	-3.0%	-0.7%	2.3%
2004	-3.0%	-0.3%	2.6%
2005	2.8%	0.0%	1.5%
2006	-3.1%	-0.8%	0.4%
2007	4.2%	-1.1%	0.5%
2008	0.5%	-2.3%	-1.3%
2009	-6.7%	-2.6%	-0.4%
2010	-1.5%	1.8%	2.9%
2011	-1.0%	1.5%	0.3%
2012	-2.4%	-0.6%	0.9%
2013	-3.1%	0.9%	0.2%
2014	-1.9%	1.3%	0.7%
2015	-2.1%	-1.0%	0.6%
2000-2015	-1.1%	0.0%	1.0%
2011-2015	-2.1%	0.4%	0.5%

[24] Statistics Canada. Table 383-0021 - Multifactor productivity, value-added, capital input and labour input in the aggregate business sector and major sub-sectors, by North American Industry Classification System (NAICS), annual (index, 2007=100 unless otherwise noted), CANSIM (database). (accessed: June 2016)

[25] Statistics Canada. Table 383-0021 - Multifactor productivity, value-added, capital input and labour input in the aggregate business sector and major sub-sectors, by North American Industry Classification System (NAICS), annual (index, 2007=100 unless otherwise noted), CANSIM (database). (accessed: June 2016)

[26] Bureau of Labor Statistics, Office of Productivity and Technology, Division of Major Sector Productivity. *Net Multifactor Productivity and Costs, Private Non-Farm Business Sector*. March 30, 2017.

Section 4:
Prior X-Factor Research

Table 4 includes the results presented in response to Régie information request 4.2, as well as the new X factor results.

Table 4: X Factor Study Results

Proceeding	*Expert*	*Participant*	*TFP Study Results*	*Proposed X Factor (%) Expert/Company*	*Stretch Factor (%) Expert/Company*	*Sample / Time Period*
2012 Alberta - Generic PBR Proceeding	Brattle Group	ATCO Electric/ATCO Gas	-1.59%; -2.82%	-2.0%	No	1994-2009 and 1999-2009
2012 Alberta - Generic PBR Proceeding	Navigant	EPCOR	-1.0%	-1.0%	0.2%	1999-2009
2012 Alberta - Generic PBR Proceeding	London Economics	FortisAlberta	-0.71%	-1.0%	No	2000-2009
2012 Alberta - Generic PBR Proceeding	Christensen Associates	AltaGas	-1.02%	-1.3%	0.1% to 0.2%	2000-2009
2012 Alberta - Generic PBR Proceeding	PEG	CCA	1.32%	1.08% to 1.32%	0.19% to 0.5% / 0.19% *	34 US gas distribution companies over the period 1996-2009 (PEG data), 1989-2007 (NERA data)
2012 Alberta - Generic PBR Proceeding		City of Calgary	Rec. based on NERA and PEG results	1.0% to 1.7%	0.13% to 0.5%	
2012 Alberta - Generic PBR Proceeding	NERA	AUC	0.85% in first estimate, 0.96% in adjusted estimate	0.96%		72 US electric and combination electric/gas utilities (distribution portion), 1972-2009
Final Commission Decision				0.96%	0.2%	
2012 Ontario Renewed Regulatory Framework for Electricity Distributors	PEG	OEB	0.19% between 2002-2011, -0.33% 2002-2012	0%	Varied depending on relative efficiency	71 Ontario distributors, 2002-2011/12
Final Commission Decision				0%	0.0% - 0.6%	
2014 Ontario – Enbridge Gas Distribution Inc. 2014-2018 Rate Application	Concentric (Coyne)	Enbridge	-0.32%	0%	No	25 US natural gas utilities, 2000-2011
2014 Ontario – Enbridge Gas Distribution Inc. 2014-2018 Rate Application	PEG	OEB	1.91% (Enbridge) 1.65% (Union)	Implicit X factor, 60% of inflation in 2008, 55% in 2009 and 2010, 50% in 2011, 45% in 2012	0.31% (expressed as "difference of the differences")	Enbridge & Union; 2005-2010

Final Commission Decision				Building block approach approved with a 5-year rate plan		
2014 Maine - Central Maine Power Company, Request for New Alternative Rate Plan	PEG (Lowry)	Central Maine Power	O&M Productivity 0.40% (2002-2011)	O&M X factor for CMP: 0.22% (which includes stretch factor)	0.2%	30 US utilities in Northeast Productivity Growth Peer Group, 2002-2011
Final Commission Decision				CMP withdrew its request for a new Alternative Regulation Plan (ARP) that included an indexed approach to O&M and stairstep approach to capital expenses		
2014 British Columbia – Fortis BC Inc. Multi-Year Performance Based Ratemaking Plan for 2014-2018	PEG (Lowry)	CEC	0.96% for gas; 0.93% for electric	0.96% for gas; 0.93% for electric	0.2%	64 gas utilities, 75 electric utilities
2014 British Columbia – Fortis BC Inc. Multi-Year Performance Based Ratemaking Plan for 2014-2018	Black and Veatch	FortisBC	-3.13% to -4.93%	0% / 0.5% *		95 US utilities operating in 30 states, 2007-2011
Final Commission Decision				0.93% for FBC, 0.90% for FEI	0.1% for FBC; 0.2% for FEI	
2015 Ontario - Toronto Hydro-Electric System Limited, Electricity Distribution Rates for 2015 – 2019	Power System Engineering	Toronto Hydro	Benchmarking study; no TFP results	Toronto Hydro filed for a "Custom IR" plan incorporating a combination of OEB Productivity Factor and Custom Stretch Factor and a Custom Capital Factor	0.3%, and the stretch factor should not apply to capital	4 US utilities serving core urban areas
2015 Ontario - Toronto Hydro-Electric System Limited, Electricity Distribution Rates for 2015 – 2019	PEG (Kaufmann)	OEB	-0.27%;-0.33%; 0.19%	0.0%	0.6%- 1.0%	Utilities serving 27 US cities; 2002-2012

Final Commission Decision				Custom IR plan approved with combination of OEB Productivity Factor and Stretch Factor of 0.6%, and Custom Capital Factor	0.6%, and stretch factor will apply to the C-factor	
2016 Alberta - Generic PBR Proceeding	Brattle (Brown and Carpenter)	Distribution Utilities (other than EPCOR)	-0.37% to -1.37%	-0.79%		67 utilities, 2000-2014
2016 Alberta - Generic PBR Proceeding	Christensen Associates (Meitzen)	EPCOR	-1.11%	-1.11%		68-72, Average of last 15 (2000-2014) and last 10 (2005-2014) years
2016 Alberta - Generic PBR Proceeding	PEG (Lowry)	CCA	0.36% to 1.03%	0.43% 0.78%		88, 21, 1997-2014
Final Commission Decision				0.3%	None	
2017 Ontario - Hydro One Distribution (2018-2022 Custom IR) Proceeding Ongoing	Power System Engineering	Hydro One Distribution	-0.9%	0.0%	0.6%	2002-2015, Hydro One TFP: 1 firm PEG Update: 73 firms

Section 5:
Conclusions

Concentric is of the view that the recent TFP studies submitted in Alberta and Ontario provide a reasonable basis for informing the Régie's determination of an X factor for HQD's initial MRI program. These studies incorporate both broad and targeted samples of U.S. electric utilities in the case of the studies submitted in Alberta, and an Ontario specific electric utility group in the study submitted in Ontario. These four studies cover the most recent periods for which data was available, incorporating data back to 1997 and up through 2015, depending on the study. The range of results is summarized below.

Table 5: Recent Productivity Study Ranges

Brattle	-0.37% to -1.37%
Christensen	-1.11%
PEG	0.36% to 1.03%
PSE	-0.9%
Range	-1.37% to 1.03%

Three of the four experts estimate negative productivity growth for their industry samples over the entire period of analysis, consistent with the broader Statistics Canada utility data. All of the studies show lower (or more negative) productivity growth in the more recent time period, suggesting these longer term averages may overstate current productivity trends due to the leveling of demand growth without a comparable reduction in inputs.

Attachments

The most recent productivity studies in Ontario and Alberta and the recent Alberta decision are provided as attachments.

- Ontario; Power System Engineering

  (Application Appendix A, see page 97 of PDF.)
- Alberta; Brattle
- Alberta; Christensen

  (Application Appendix B, see page 185 of PDF.)
- Alberta; PEG
- Alberta Utilities Commission Decision