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A European comparison of electricity and gas prices for large industrial consumers

25 April 2019 Final report **2019 update**







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1. Executive Summary

1. Executive Summary

1.1 Executive Summary – English

In this 2019 update, energy prices for six industrial consumer profiles (four electricity, two natural gas) are compared between Belgium and four other countries: Germany, the Netherlands, France and the United Kingdom. When relevant, results are not presented on a countrywide basis but rather on a regional basis. **Results from this 2019 report are compared to the results rendered by the 2016 report published by the CREG on the 29th of March 2016, the 2017 price comparison published by the CREG on the 29th of June 2017 and the 2018 price comparison published by the CREG on the 29th of June 2017 and the 2018 price comparison published by the CREG on the 16th of July 2018.¹²³ This 2019 update is often referred to "2019" when comparing to reports from previous years and presents prices in application as of January 1st 2019. The comparison looks at three components of the bill: commodity cost, network cost and all other costs: taxes, levies, certificate schemes.**

The **consumer profiles** were composed based on a thorough analysis (published in the 2016 report) of the industrial fabric of the Belgian regions, with extended stakeholder input. Consumer profiles E1 and E2 represent industrial electricity consumers with an annual consumption of respectively 10 and 25 GWh. Consumer profiles E3 and E4 represent very large industrial electricity consumers, amounting to an annual consumption of respectively 100 GWh and 500 GWh. In the case of gas, a large industrial consumer (profile G1) with a consumption of 100 GWh a year and a very large industrial consumer (profile G2) with a consumption of 2,5 TWh a year are presented. Furthermore, the option that profile G2 uses gas as a raw material (feedstock) is presented in the study, while it has been excluded for profile G1.

The price comparison is preceded by an **elaborate description** of the build-up of prices and price components. General hypotheses are adopted and their application across different countries is carefully described in order to maximize the objectivity of the comparison. Energy costs are analysed from the bottom-up, and the different price components are described in a detailed way in order to offer a clear view of the origins of the observed results.

In terms of **electricity**, this report highlights a great deal of complexity as a consequence of government intervention aiming at reducing electricity costs for some categories of large industrial consumers. These interventions are specifically targeted at the second (network costs) and third component (taxes, levies, certificate schemes).

Results in 2019 are very similar to the results from the previous reports, and most of the general conclusions still hold. The lowest electricity cost for consumer profiles E1 and E2 can still be found in the Netherlands. While France now offers the lowest electricity cost for consumer profiles E3, Germany remains the cheapest for E4. The application of several tax and network cost reductions in the Netherlands, Germany and – to a lesser extent – France, depends on a host of very specific economic criteria generally linked to electro-intensity, which obliges us to present the results in terms of a fairly large range of possibilities. The highest possible electricity cost for every profile under review can therefore be found in Germany, for consumers who cannot appeal to the reduction criteria, and to a lesser extent, in the United Kingdom.

¹ The 2016 report is available on the CREG website: <u>http://www.creg.info/pdf/Divers/20160629-</u> EnergyPrices-FinalReport.pdf

² The 2017 report is available on the CREG website : <u>http://www.creg.be/sites/default/files/assets/Publications/Studies/2017-</u> <u>PwC Report A European comparison of electricity and gas for large industrial consumers</u> <u>o.pdf</u>

³ The 2018 report is available on the CREG website : https://www.creg.be/fr/publications/etudef20180716



Compared to 2018, France sees its comparative competitive position improve slightly notably due to being the least impacted by the surge of commodity prices.

In terms of Belgian competitiveness, general conclusions for 2019 are very similar to all three previous years. For all electricity consumption profiles, only one neighbouring country is certainly less competitive than Belgium: the United Kingdom. Similarly, for all consumption profiles and in all cases, the Netherlands are more competitive than Belgium. The differences between the Flemish and Walloon regions remain most significant for profiles E1 and E2, where the electricity cost is substantially higher in the Walloon region. For profiles E3 and E4, the picture is more nuanced, with the Walloon region being more competitive for E3, while the Flemish region is slightly more competitive for E4.

For **gas prices**, the differences observed between countries are smaller than for electricity, as are the ranges of possibilities within countries. We observe considerably less complexity and although some reductions or exemptions on taxes for industrial consumers that use gas as a raw material (feedstock) apply, government intervention with regards to taxes and network costs is in general less common. It is remarkable that the differences in gas prices almost completely disappeared with the exception of France because of the merger between PEG Nord and TRS market areas.

Commodity cost makes up for a greater part of the gas bill than the electricity bill, but its impact on the differences between countries is larger for electricity than for gas. While power market indices in all countries have gone up compared to 2018, Germany keeps a sizeable competitive advantage on the other countries in terms of electricity commodity cost. On the other hand, gas market prices remain largely identical across the observed countries.

For industrial gas consumers, Belgium offered the lowest cost of all countries under review in 2016, 2017, 2018, except when comparing to feedstock consumers in the Netherlands and France for profile G2. In 2019 this is still the case, with two minor evolutions. Firstly, the gap between the Netherlands and Belgium for profile G2 feedstock consumers has slightly reduced due to a lower rise of commodity prices in Belgium. Besides, this difference is even more mitigated as most Belgian industrial contracts take TTF as their main component. Further, as it was the case in 2018, the Brussels region is still more expensive than the Netherlands for non-feedstock consumers.

In **a last chapter**, sector and region specific electricity and gas prices are analysed in terms of their impact on the competitiveness of industrial consumers. It has to be noted that some competitors of the Belgian industrial consumers benefit from important reductions on several price components. These are based on national criteria for electro-intensity, which can differ in severity and selectiveness in the neighbouring countries. For this part of the study, the conclusion of the 2016, 2017 and 2018 updates still applies for this 2019 report.

Nevertheless, a distinction between electro-intensive and non-electro-intensive consumers is very important as the situation for all important industrial sectors in Belgium is less beneficial when they compete with electro-intensive consumers in neighbouring countries than when they compete with non-electro-intensive consumers. More specifically, industrial consumers in Belgium which compete with non-electro-intensive consumers in the neighbouring countries have a clear competitive advantage in terms of total energy cost. For Belgian industrial consumers competing with their counterparts in neighbouring countries which benefit from reductions for electro intensive consumers, the situation slightly worsened compared to the previous year. The total energy cost still constitutes a competitiveness problem when compared to Germany, France and the Netherlands. Furthermore, the positive impact of the relatively low gas cost for Belgium almost completely disappeared. Although some sectors consume twice as much natural gas as electricity, the lower cost per energy unit of natural gas induces that electricity plays the determining role in the total energy cost competitiveness. Finally, the



situation in the Walloon and the Brussels regions is generally less favourable than in Flanders. This is most striking for industrial sectors with an important proportion of smaller industrial electricity consumers (E1 and E2).

To conclude, it can be stated that - as it was the case in 2016, 2017 and 2018, - a portion of the Belgian tax income is directed towards protecting consumers that are not particularly affected by a lack of competitiveness of electricity prices, while more vulnerable consumers suffer from an important disadvantage compared to their electro-intensive competitors in neighbouring countries.

In all three previous years, we wrote that it could be interesting to reflect upon the possible adaptations of the present tax reductions for industrial consumers that have been put in place by federal and regional governments in Belgium. The general objective should be to generate an evolution towards more competitive total energy prices for electro-intensive industrial consumers, while preserving (part of) the current competitive advantage for non-electro intensive consumers (in the limits of what is allowed by the European legislation). Based on the results for 2019, we continue to support this recommendation.

A series of simulations on Belgian industrial consumers conducted by PwC at the request of the CREG (in response to a request from the federal Minister of Energy) in November 2016 suggest that governments – through the European Commission Framework EEAG – have a wide range of opportunities where choices have to be made on three levels:

- 1) The level of competitiveness for electro-intensive companies,
- 2) The level of competitiveness for non-electro-intensive companies,
- 3) The cost of reductions for the government budget, knowing that renewable cost will be rising.

1.2 Executive Summary – Nederlands

In deze update van 2019 voor de jaarlijkse omtrent een Europese tariefvergelijking voor de elektriciteits- en gasprijzen voor industriële verbruikers, worden opnieuw de energieprijzen voor zes industriële verbruikers (vier in elektriciteit en twee in aardgas) vergeleken tussen België en vier andere landen: Duitsland, Nederland, Frankrijk en het Verenigd Koninkrijk. Wanneer dit relevant is, worden de resultaten niet op nationale basis gepresenteerd, maar wel in zones. **De resultaten voor 2019 worden vergeleken met de resultaten van de prijsvergelijking van 2016, door de CREG gepubliceerd op 29 juni 2016, de prijsvergelijking van 2017, door de CREG gepubliceerd op 29 maart 2017, en de prijsvergelijking van 2018, door de CREG gepubliceerd op 16 juli 2018.⁴⁵⁶ De update van 2019 wordt vaak simpelweg "2019" genoemd in vergelijking met verslagen van voorgaande jaren. De 2019-update presenteert de prijzen die vanaf 1 januari 2019 van toepassing zijn. De vergelijking behandelt de drie componenten van de eindfactuur: commodity prijzen, netwerktarieven en alle andere kosten: belastingen, toeslagen en certificaatbijdragen.**

De **consumptieprofielen** werden opgesteld op basis van een diepgaande analyse (gepubliceerd in 2016) van het industrieel weefsel van de Belgische gewesten, met uitgebreide input van stakeholders. Consumptieprofielen E1 en E2 vertegenwoordigen industriële elektriciteitsverbruikers met een jaarlijkse consumptie van respectievelijk 10 en 25 GWh. Consumptieprofielen E3 en E4 daarentegen vertegenwoordigen industriële grootverbruikers van elektriciteit met een jaarlijks verbruik van respectievelijk 100 en 500 GWh. In het geval van aardgas, zijn één industriële grootverbruiker (profiel G1) met een consumptie van 100 GWh per jaar en één met een jaarlijks verbruik van 2,5 TWh geselecteerd. Bovendien wordt voor het geval van profiel G2 de mogelijkheid voorzien dat deze aardgas gebruikt als grondstof (feedstock), terwijl we deze mogelijkheid niet voorzien hebben in de studie voor profiel G1.

De prijsvergelijking wordt voorafgegaan door een uitgebreide **beschrijving van de opbouw van de prijscomponenten**. Om een zo objectief mogelijke vergelijking te realiseren worden een aantal algemene hypothesen aangenomen en de toepassing ervan wordt zorgvuldig beschreven. De totale energiekost wordt bottom-up geanalyseerd en de verschillende componenten worden in detail beschreven om een duidelijk zicht te houden op de oorsprong van de eindresultaten.

Voor **elektriciteit** stelt dit rapport een grote complexiteit vast als gevolg van overheidsinterventies die erop gericht zijn de elektriciteitskost voor sommige categorieën grote industriële verbruikers te verminderen. Deze ingrepen zijn specifiek gericht op de tweede (netwerkkost) en derde prijscomponent (belastingen, toeslagen en certificaatsystemen).

Resultaten in 2019 zijn erg gelijklopend met de resultaten van de voorgaande jaren, en de meeste conclusies gelden nog steeds. We stellen vast dat Nederland nog steeds de laagste elektriciteitskost biedt voor consumptieprofielen E1 en E2. Frankrijk heeft in 2019 echter de laagste elektriciteitskosten voor consumentenprofiel E3, terwijl voor E4 de laagste kosten bij Duitsland blijven. De toepassing van de verschillende verminderingen op de netwerkkost en de belastingen in Nederland, Duitsland en (in mindere mate) Frankrijk, hangt immers af van een hele reeks specifieke economische criteria die in het algemeen gelinkt worden aan elektro-intensiteit, waardoor het resultaat een relatief breedspectrum beslaat. Hierdoor biedt Duitsland voor grootverbruikers die niet voldoen aan deze criteria ook de hoogste

⁴ Het rapport uit 2016 is beschikbaar op de website van de CREG: <u>http://www.creg.info/pdf/Divers/20160629-EnergyPrices-FinalReport.pdf</u>

⁵ Het rapport uit 2017 is beschikbaar op de website van de CREG: http://www.creg.be/sites/default/files/assets/Publications/Studies/2017-PwC Report A European comparison of electricity and gas for large industrial consumers

<u>o.pdf</u> ⁶ Het rapport uit 2018 is beschikbaar op de website van de CREG: https://www.creg.be/nl/publicaties/studie-f20180716



elektriciteitskost voor alle profielen in deze studie, gevolgd door het Verenigd Koninkrijk.

Vergeleken met 2018, zien de Franse industriële grootverbruikers van elektriciteit hun competitieve positie lichtjes vooruitgaan omwille van een zwakkere stijging van de commoditykosten ten opzichte van de andere landen.

De conclusies aangaande de competitiviteit van België voor 2019 komen voor het grootste deel overeen met deze van 2016, 2017 en 2018 en zijn dus gemengd. Voor alle industriële elektriciteitsverbruikers is er slechts één buurland minder competitief dan België: het Verenigd Koninkrijk. Voor alle elektriciteitsverbruikers en in alle gevallen heeft België een hogere elektriciteitskost dan Nederland. De verschillen tussen Vlaanderen en Wallonië blijven het grootst voor profielen E1 en E2, waarbij de elektriciteitskost substantieel hoger is in Wallonië. Voor profielen E3 en E4 is het besluit meer genuanceerd, waarbij de prijzen in Wallonië competitiever zijn voor profiel E3 en in Vlaanderen voor profiel E4.

Voor wat betreft **aardgas** zijn de verschillen tussen de landen kleiner dan voor elektriciteit en ook de waaier aan mogelijkheden binnen de landen is kleiner. In het algemeen is de prijssamenstelling minder complex en, hoewel er enkele kortingen en vrijstellingen bestaan op belastingen voor industriële grootverbruikers die aardgas gebruiken als een grondstof (feedstock), stellen we in het algemeen minder overheidsinterventie vast op gebied van transportkosten en belastingen. Het is opvallend dat verschillen in de commodity component bijna volledig verdwenen zijn, met uitzondering van Frankrijk, als gevolg van de fusie tussen PEG Nord en TRS

De kost van de commodity heeft een groter aandeel in de eindprijs voor aardgas dan voor elektriciteit, maar speelt een meer bepalende rol voor elektriciteit. Hoewel marktindicatoren voor elektriciteit in alle landen gestegen zijn ten opzichte van vorig jaar, heeft Duitsland nog steeds een substantieel competitief voordeel ten opzichte van de andere landen qua commoditykost voor elektriciteit, terwijl de marktprijzen voor aardgas nog steeds grotendeels overeenkomen in de verschillende landen.

Voor industriële gasverbruikers bood België in 2016, 2017 en 2018 de laagste kosten van alle onderzochte landen, behalve in vergelijking met de grondstoffenverbruikers in Nederland en Frankrijk voor profiel G2. In 2019 is dit nog steeds het geval, met twee kleine evoluties. Ten eerste is de kloof tussen Nederland en België voor de verbruikers van grondstoffen van profiel G2 iets kleiner geworden door een lagere stijging van de grondstofprijzen in België. Bovendien wordt dit verschil nog meer verzacht doordat de meeste Belgische industriële contracten TTF als hoofdbestanddeel nemen. Bovendien is het Brusselse gewest, net als in 2018, nog steeds duurder dan Nederland voor niet-voedingsmiddelenverbruikers.

In een **laatste hoofdstuk** worden sector- en regio-specifieke elektriciteits- en aardgasprijzen geanalyseerd op het vlak van hun impact op de competitiviteit van industriële grootverbruikers. Hierbij is het niet onbelangrijk te vermelden dat sommige concurrenten van Belgische industriële grootverbruikers kunnen profiteren van belangrijke kortingen op verschillende prijscomponenten. Deze zijn gebaseerd op nationale criteria inzake elektro-intensiteit, die verschillen in gradatie en selectiviteit in de buurlanden. Voor dit gedeelte van de studie gelden onze conclusies van 2016, 2017 en 2018 nog altijd grotendeels in 2019.

Desondanks is een onderscheid tussen elektro-intensieve en niet-elektro-intensieve verbruikers zeer belangrijk aangezien de situatie voor alle belangrijke industriële sectoren in België minder gunstig is wanneer deze vergeleken worden met elektrointensieve verbruikers in de buurlanden, dan wanneer deze vergeleken worden met niet-elektro-intensieve verbruikers. Industriële verbruikers in België die concurreren met niet-elektro-intensieve verbruikers in de buurlanden hebben immers een duidelijk competitief voordeel met betrekking tot hun totale energiekost. Voor industriële verbruikers die concurreren met elektro-intensieve verbruikers in de buurlanden is de situatie lichtjes verslechterd. Hun totale



energiekost vormt nog steeds een concurrentieprobleem met Frankrijk, Duitsland en Nederland.

Verder is de positieve impact van de relatief lage aardgasprijzen in België bijna volledig verdwenen. Hoewel sommige sectoren tweemaal zo veel aardgas als elektriciteit verbruiken, zorgt een lagere kost per eenheid van energie voor aardgas ervoor dat elektriciteit de meest doorslaggevende rol speelt in het bepalen van de totale energiekost en de competitiviteit. Ten slotte is de situatie in het Waalse en Brusselse Gewest over het algemeen minder gunstig dan in Vlaanderen. Dit is het meest opvallend voor industriële sectoren met een belangrijk aandeel kleinere industriële elektriciteitsverbruikers (E1 en E2).

Tot slot kan men stellen dat – zowel in 2016, 2017, 2018 als in 2019 – een deel van de belastinginkomsten in België gebruikt worden voor het beschermen van verbruikers die niet in het bijzonder getroffen worden door een gebrek aan competitiviteit op het vlak van elektriciteitsprijzen, terwijl meer kwetsbare verbruikers benadeeld worden in vergelijking met hun elektro-intensieve concurrenten in de buurlanden.

In alle drie voorgaande jaren, schreven we dat het daarom nuttig kon zijn om in België stil te staan bij een eventuele aanpassing van de huidige belastingvermindering voor industriële verbruikers die ingesteld zijn door de federale en gewestelijke regeringen. In het algemeen, schreven we, zou een evolutie naar een meer concurrentiële energieprijs voor elektro-intensieve verbruikers het doel moeten zijn, terwijl men (een deel van) het huidige concurrentievoordeel voor niet-elektro-intensieve verbruikers moet behouden (voor zover Europese wetgeving het toestaat). Op basis van de resultaten voor 2019 blijven we achter deze aanbeveling staan.

Een aantal simulaties op industriële verbruikers in België die door PwC werden uitgevoerd op vraag van de CREG (en in antwoord op een vraag van de federale Minister van Energie) in november 2016 toont aan dat regeringen door het EEAG framework van de Europese Commissie een brede waaier aan mogelijkheden hebben om in te grijpen, maar dat keuzes gemaakt moeten worden op drie niveaus:

- 1) Het competitiviteitsniveau van elektro-intensieve bedrijven,
- 2) Het competitiviteitsniveau van niet-elektro-intensieve bedrijven,
- 3) De kost van de verminderingen voor de overheidsbegroting, in de wetenschap dat de kost van hernieuwbare energie nog zal stijgen.

1.3 Executive Summary – Français

Dans ce rapport mis à jour pour 2019, les prix de l'énergie pour six profils de consommateurs industriels (quatre en électricité, deux en gaz naturel) sont comparés entre la Belgique et quatre autres pays : l'Allemagne, les Pays-Bas, la France et le Royaume-Uni. Lorsque cela est pertinent, les résultats sont présentés non pas sur une base nationale mais sur une base régionale. **Les résultats présentés dans ce rapport sont également comparés aux résultats de 2016 qui avaient été publiés par la CREG le 29 juin 2016, aux résultats de 2017 qui avaient été publiés par la CREG le 29 mars 2017 et aux résultats de 2017 qui avaient été publiés par la CREG le 29 mars 2017 et aux résultats de 2018 publiés par la CREG le 16 juillet 2018.⁷⁸⁹ Il est fréquemment fait référence à cette mise-à-jour 2019 comme "2019" lors de la comparaison avec les précédents rapports. Cette mise-à-jour 2019 présente des résultats basés sur les prix en application en janvier 2019. La comparaison traite des trois composantes de la facture finale: le coût de la commodité, les coûts de réseaux et l'ensemble des autres coûts: taxes, surcharges et systèmes de certificats verts.**

Les **profils de consommation** ont été composés sur la base d'une analyse approfondie (publiée dans le rapport 2016) du tissu industriel des régions belges et avec l'apport d'informations complémentaires de parties prenantes. Les profils E1 et E2 représentent des consommateurs industriels d'électricité ayant une consommation annuelle de respectivement 10 et 25 GWh. Les profils E3 et E4 représentent des consommateurs industriels d'électricité dont la consommation est très importante, s'élevant sur une base annuelle à respectivement 100 GWh et 500 GWh. Dans le cas du gaz naturel, un grand consommateur industriel (profil G1) avec une consommation de 100 GWh par an et un très grand consommateur industriel (profil G2) avec une consommation de 2,5 TWh par an sont présentés. En outre, le cas où le profil G2 utilise le gaz naturel comme matière première (feedstock) est présenté dans l'étude, alors qu'il a été exclu pour le profil G1.

La comparaison des prix est précédée par une **description élaborée des composantes** détaillées du prix et de la méthodologie suivie pour la comparaison. Des hypothèses générales ont été adoptées et leur application à travers différents pays est soigneusement décrite afin de maximiser l'objectivité de la comparaison. Le coût total de l'énergie est analysé et reconstruit complètement, tout en décrivant les différentes composantes de façon détaillée afin d'offrir une vue aussi claire que possible sur l'origine des résultats observés.

En ce qui concerne **l'électricité**, ce rapport met en exergue la grande complexité induite par des interventions gouvernementales visant à réduire le coût de l'électricité pour certaines catégories de grands consommateurs industriels. Ces interventions concernent surtout la deuxième et troisième composante (respectivement les coûts de réseaux, et les taxes, surcharges et systèmes de certificats).

Les résultats en 2019 sont très similaires aux résultats des trois rapports précédents, et la grande majorité des conclusions est toujours d'application. Les Pays-Bas présentent toujours les prix de l'électricité les plus faibles pour les profils E1 et E2. La France présente dorénavant les prix les plus bas pour les profils E3 tandis que l'Allemagne ceux pour les profils E4. L'application des nombreuses réductions de taxes et surcharges et de coûts de réseaux aux Pays-Bas, en Allemagne et, dans une moindre mesure, en France, dépend d'une série de critères économiques et géographiques très précis – généralement liés à l'électro-intensité - qui nous oblige à présenter les résultats sous forme d'une gamme de possibilités relativement

⁷ Le rapport 2016 est publié sur le site de la CREG <u>http://www.creg.info/pdf/Divers/20160629-EnergyPrices-FinalReport.pdf</u>

⁸ Le rapport 2017 est publié sur le site de la CREG <u>http://www.creg.be/sites/default/files/assets/Publications/Studies/2017-</u> <u>PwC Report A European comparison of electricity and gas for large industrial consumers</u> <u>o.pdf</u>

⁹ Le rapport 2018 est publié sur le site de la CREG https://www.creg.be/fr/publications/etudef20180716

étendue. Les prix les plus élevés pour l'électricité peuvent dès lors être trouvés en Allemagne, pour les consommateurs ne pouvant satisfaire à ces critères permettant de bénéficier des réductions, et dans une moindre mesure, au Royaume-Uni.

Comparé à 2018, les consommateurs industriels d'électricité en France voient une légère amélioration de leur compétitivité en raison notamment d'une hausse moins importante du coût de commodité que dans les autres pays.

En ce qui concerne la compétitivité de la Belgique, les conclusions générales pour 2019 sont très similaires à celles des trois années précédentes. Pour tous les profils de consommation d'électricité, le Royaume-Uni est le seul pays voisin qui est sensiblement moins compétitif que la Belgique. De façon similaire, pour tous les profils de consommation et dans tous les cas, les Pays-Bas sont plus compétitifs que la Belgique. La différence entre la Flandre et la Wallonie reste plus importante pour les profils E1 et E2 pour lesquels le coût de l'électricité est sensiblement plus élevé en Région wallonne. Pour les profils E3 et E4, le résultat est plus nuancé, la Région wallonne étant légèrement plus compétitive pour le profil E3 alors que la Région flamande est plus compétitive pour le profil E4.

En ce qui concerne le **gaz naturel**, les différences de prix finaux observées entre les pays ainsi que les gammes de résultats possibles au sein d'un même pays sont moins grandes que pour l'électricité. Nous observons sensiblement moins de complexité et l'intervention gouvernementale en matière fiscale ou sur les coûts de réseaux est généralement moins fréquente, même si certaines réductions ou exemptions fiscales pour les consommateurs industriels qui utilisent le gaz naturel comme matières premières (feedstock) existent. Il est à remarquer que les différences au niveau de la composante commodité ont presque complètement disparu, hormis pour la France dès suite de la fusion des zones de prix PEG Nord et TRS.

Le coût de la commodité représente une part plus importante de la facture gaz que celle d'électricité, mais son impact sur les différences observées entre pays est cependant plus important pour l'électricité que pour le gaz naturel. Alors que les indices boursiers dans tous les pays ont augmentés en 2019 par rapport à 2018, l'Allemagne préserve son avantage compétitif considérable par rapport aux autres pays en termes de coût de la commodité en électricité, alors que les prix sur les marchés du gaz naturel restent généralement très similaires dans les pays de l'échantillon.

Pour les consommateurs industriels de gaz naturel (G1 et G2), la Belgique offrait en 2016, 2017 et 2018 le coût le plus faible de l'ensemble des pays considérés dans ce rapport, à l'exception des consommateurs industriels utilisant le gaz naturel comme matière première aux Pays-Bas et en France pour le profil G2. En 2019, ceci est généralement toujours le cas, mais à nuancer avec deux évolutions mineures. Tout d'abord, l'écart entre les Pays-Bas et la Belgique pour les consommateurs du profil G2 utilisant le gaz naturel comme matière primaire s'est légèrement réduit suite à une hausse plus faible des coûts de la commodité. L'impact en est néanmoins modéré étant donné que la majorité des contrats des industriels belges sont indexés sur base du TTF. Par ailleurs, comme constaté en 2018, la Région bruxelloise reste plus chère que les Pays-Bas pour les consommateurs qui n'utilisent pas le gaz naturel comme feedstock.

Dans un dernier chapitre, les prix de l'électricité et les prix du gaz naturel par secteur et par région sont analysés en termes d'impact sur la compétitivité des consommateurs industriels. Il est important de noter que quelques concurrents des consommateurs industriels belges bénéficient d'importantes réductions sur plusieurs composantes du prix. Celles-ci sont basées sur des critères nationaux d'intensité de consommation électrique, qui peuvent différer en niveau et en sélectivité dans les pays voisins. Pour cette partie de l'étude, nos conclusions 2016,2017 et 2018 s'appliquent toujours pour 2019.

Néanmoins, la distinction entre les consommateurs électro-intensifs et non-électrointensifs est très importante car la situation pour tous les secteurs industriels importants en Belgique est moins avantageuse quand on les compare aux



concurrents électro-intensifs que quand on les compare aux concurrents nonélectro-intensifs dans les pays voisins. Plus spécifiquement, les consommateurs industriels belges en concurrence avec les consommateurs non-électro-intensifs des pays voisins ont un net avantage concurrentiel en termes de coût énergétique total. Pour les clients industriels belges qui sont en concurrence avec des consommateurs considérés comme électro-intensifs dans les pays voisins, la situation s'est légèrement détériorée par rapport à l'année précédente. *In fine*, leur coût énergétique total pour ces consommateurs reste problématique par rapport à la concurrence française, néerlandaise et allemande.

En outre, l'impact positif du coût du gaz naturel relativement bas pour la Belgique a presque complètement disparu. Bien que quelques secteurs consomment deux fois plus de gaz naturel que d'électricité, le coût réduit par unité de gaz naturel fait que l'électricité joue un rôle déterminant dans la compétitivité du coût énergétique total. Enfin, la situation en Région wallonne et en Région de Bruxelles-Capitale est généralement moins favorable qu'en Flandre. Cet effet est plus marqué pour les secteurs industriels composés d'une proportion importante de petits consommateurs industriels d'électricité (E1 et E2).

Pour conclure, on peut considérer qu'en 2019 comme pour les trois années précédentes, une partie des recettes fiscales en Belgique est utilisée pour protéger des consommateurs qui ne sont pas particulièrement affectés par un manque de compétitivité des prix de l'électricité, alors que des consommateurs plus vulnérables souffrent d'un désavantage important comparé à leurs concurrents électro-intensifs localisés dans les pays voisins.

En 2016, 2017 et 2018, nous avions par conséquent écrit qu'il pourrait être utile de réfléchir à la possibilité d'une adaptation des réductions de surcharges actuelles qui ont été mises en place par les gouvernements fédéraux et régionaux et dont bénéficient les consommateurs industriels. L'objectif général, devrait être de faire évoluer les prix de l'énergie totaux vers des niveaux plus compétitifs pour les consommateurs industriels électro-intensifs, tout en préservant (une partie de) l'avantage concurrentiel pour les consommateurs non-électro-intensifs (pour autant qu'autorisé par la législation européenne). Sur la base des résultats de 2019, nous continuons à supporter cette recommandation.

Une série de simulations par rapport à la consommation industrielle belge, exécutée par PwC à la demande de la CREG en novembre 2016, en réponse à une demande de la Ministre fédérale de l'Energie, indique que les gouvernements — en utilisant le cadre EEAG de la Commission européenne — ont un large panel de possibilités pour intervenir, mais doivent faire des choix à trois niveaux :

1) le niveau de compétitivité requis pour les électro-intensifs,

2) le niveau de compétitivité requis pour les non-électro-intensifs,

3) le coût des réductions pour le budget de l'Etat fédéral, tout en sachant que les coûts du renouvelable vont augmenter.





2. Introduction

This report is an update of the previous report commissioned by the CREG, the Belgian federal regulator for Energy and Gas, published 16 July 2018¹⁰. In the framework of the CREG's larger mission of supervising transparency and competition on the market, ensuring market conditions serve the public interest and safeguarding consumers' essential interests, PricewaterhouseCoopers was asked to conduct a study comparing industrial energy prices in Belgium and the neighbouring countries.

The purpose of this study is to compare the natural gas and electricity prices, in total as well as per component, billed to large industrial consumers in the three Belgian regions (Flanders, Wallonia, and Brussels capital) with those in Germany, France, the Netherlands and the United Kingdom. This report contains an update on the 2018 report, with electricity and natural gas prices observed in January 2019. In addition to this price analysis, the purpose of this study is also to assess the impact of the observed price differences on Belgian industry. This report also pays special attention to reduction schemes that are beneficial to electro-intensive industrial consumers qualifying for certain criteria.

This report consists of three different sections.

The **first section** (described in chapter 3 to 5) consists in the actual price comparison. In terms of methodology, we built up the energy cost from the bottom up, identifying three main components: the commodity price, the network cost, and all other costs (taxes, levies and certificate schemes). In terms of structure, this report first describes the dataset and then the general assumptions in terms of consumer profiles and consumer behaviour, completed by an overview of the different zones identified in all five countries under review. We then move on to a detailed description of the deconstructed energy cost for natural gas and for electricity, carefully describing the observed regulatory framework, where we pay attention to certain trends regarding electricity and natural gas prices in Belgium and the neighbouring countries.

In the **second section** (described in chapter 6 and 7), we present the results per consumer profile, using a double analysis approach: how energy prices in Belgium compare to the other four countries, and how the three components of the energy price explain the observed final results. We also attach particular attention to the comparison of the second (network costs) and third (taxes, levies, certificate schemes) components. In a general conclusion, we give a first overview of the observed results in terms of competitiveness for Belgian industrial energy consumers.

The **third section** of this report, described in chapter 8, consists in a detailed analysis of the impact of the results from the first section on the competitiveness of industry in the three Belgian regions. We analyse the impact of the price differences with the neighbouring countries, paying particular attention to the total energy cost for industry on macro-economic basis where the combination of electricity and natural gas prices make up for the total energy cost. We analyse this total energy cost in the three regions for the most important industrial sectors, and describe the possible impact of these competitive advantages and disadvantages on the three regional economies and their most important industrial sectors. As a conclusion to this report, several general conclusions that can be drawn from this report are put forward, together with a host of recommendations based on these conclusions.

A preliminary version of the of this report was submitted for review to the energy regulators of Flanders (VREG), Wallonia (CWAPE), Brussels

¹⁰ The 2018 report can be found on the website of the CREG: https://www.creg.be/sites/default/files/assets/Publications/Studies/F20180716EN.pdf

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Region (Brugel), France (CRE), Germany (Bundesnetzagentur), the Netherlands (ACM) and the United Kingdom (OFGEM). This final report integrates their remarks as well as those formulated by the CREG.

3. Description of the dataset



3. Description of the dataset

3.1 General Assumptions

The general assumptions, applicable to all compared consumer profiles and countries, are outlined here after.

- 1. *January 2019.* This study gives an overview of the price levels in January 2019 and does not take any inflation effects into account.
- 2. Economically rational actors. We assume that our six profiles are economically rational actors who optimise their energy cost where and/or when possible. We assume for instance that British industrial consumers are part of a Climate Change Agreement: they focus on energy efficiency and emission reduction, and obtain tax reductions at the same time. Furthermore, we assume that all Belgian consumers have concluded a sectoral agreement whenever they had the possibility to do so.
- 3. *Exemptions and reductions*. In many cases, we observe the existence of (often progressive) reductions or exemptions on taxes, levies, certificate schemes or network costs. Whenever economic criteria such as exercising a well-defined industrial activity, or paying a certain part of your company revenue as energy cost are used to determine the eligibility for those exemptions and reductions, we do not present one single value but a range of possibilities as a result with a minimum and a maximum case.
- 4. *Commodity prices*. All market data in terms of commodity were provided by the CREG, except for the commodity price of electricity of the United Kingdom, which was completed by PwC based on Bloomberg market indices.
- 5. *Sales margin (electricity and natural gas).* No sales margin is added for natural gas and electricity commodity prices, in order to ensure maximum objectivity when comparing different countries and consumer profiles.
- 6. *Transportation cost and contractual formulas*. Whenever different tariff options are available for a client, we assume that the client always opts for the most advantageous formula. Given the predictable consumption profiles of the cases under investigation, this assumption is, according to PwC, the most realistic one.
- 7. *Natural gas pressure level and caloric value*. Industrial gas consumers directly connected to the transport grid are not connected to the same natural gas pressure level in every country. We will consider the most plausible pressure level in every country, given the nature of the natural gas network and the size of the considered client profile. We also take into account the caloric value of the natural gas in every country.
- 8. Exchange rates. For the UK comparison, we have always used the January average exchange rate to convert from Pound Sterling to Euro (0,755 GBP/€ for 2016, 0,861 GBP/€ for 2017, 0,883 GBP/€ for 2018 and 0,886 GBP/€ for 2019).¹¹ The commodity cost formula was calculated entirely in Pound Sterling, and the final result converted to Euro at the January 2016 exchange rate for 2016 results, the January 2017 exchange rate for 2017 results, the January 2018 exchange rate for 2018 results and the January 2019 exchange rate for 2019 results.
- 9. *VAT*. Following the terms of reference provided by the CREG, we do not take into account Value Added Tax (which is tax deductible for industrial clients) in this study.

¹¹ Source: National Bank of Belgium.



- 10. *UK*. Wherever this study mentions the UK, Northern Ireland is not taken into account.
- 11. *Auto-production*. We did not take into account any possibility of on-site electricity production. This implies that for the consumer profiles under review, we assume that electricity consumption (and invoicing) equals offtake.

3.2 Consumer profiles

		E1 (Electricity 1)	E2 (Electricity 2)	E3 (Electricity 3)	E4 (Electricity 4)
When?		January 2019	January 2019	January 2019	January 2019
Annual demand	MWh	10.000	25.000	100.000	500.000
Consumption profile		Baseload (working days only)	Baseload (working days only)	Baseload (including weekends)	Baseload (including weekends)
Consumption hours eq.*	h/year	5.000	5.000	7.692	8.000
Connection	kV	26-36	30-70	≥ 150	≥ 150
Grid operator ¹²		DSO (TransHS)	LTSO	TSO	TSO
Contracted capacity	kW	2.000	5.000	13.000	62.500

		G1 (Gas 1)	G2 (Gas 2)
When?		January 2019	January 2019
Annual demand	MWh	100.000	2.500.000
Consumption profile		Baseload	Baseload
Consumption hours eq.*	h/year	6.667	8.333
Grid operator		DSO (T6)	TSO
Contracted capacity	kW	15.000	300.000

¹² DSO : Distribution System Operator

TSO : Transmission System Operator

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* These are theoretical consumption hours, obtained by dividing the annual demand by the contracted capacity. Given the load profile described, E1 and E2 consume electricity during 6.257 hours per year, while E3 and E4 consume during 8.760 hours per year. G1 and G2 consume natural gas during 8.000 (G1) and 8.760 (G2) hours per year.

3.3 Electricity: Countries/zone(s) identified

Belgium

Belgium is divided in three regions, respectively Flanders, Wallonia and the Brussels-Capital Region as mapped below.



Even though transport and commodity cost for industrial electricity consumers is assumed to be identical for the entire Belgian territory, it is logical to analyse the three regions separately because of the existence of (i) differing distribution charges (for E1) and (ii) a double regional impact on the third price component: taxes, levies and certificate schemes (for all profiles).

The list below gives an overview of all Flemish DSOs that all have TRANS HS as maximal tension level and their market share at the end of 2016. The Flemish region has 11 DSOs for electricity, operated by FLUVIUS (Gaselwest, Imea, Imewo, Infrax west, Inter-Energa, Intergem, Iveg, Iveka, Iverlek, PBE and Sibelgas)¹³. For network costs - distribution tariffs for profile E1 - we will hence present a weighted average values for all 11 DSOs.

DSOs of the Flemish region	Electricity distributed MWh (2016) ¹⁴	Market share
Gaselwest	5.643.961	17,47 %
Imewo	5.201.785	16,10 %
Iverlek	4.871.780	15,08 %
Iveka	4.197.481	12,99 %
Inter-Energa	4.161.085	12,88 %
Intergem	2.591.203	8,02 %
Imea	2.213.599	6,85 %
Infrax West	1.151.443	3,56 %
Iveg	1.008.317	3,12 %
Sibelgas	642.795	1,99 %
PBE	625.065	1,94 %
Total	32.308.514	100%

¹³ As a result of the merger between EANDIS and INFRAX on July 1st 2018, FLUVIUS became the sole DSO operator in Flanders.

¹⁴ Figures from VREG



The Walloon region has 11 DSOs mainly operated by ORES (ORES Brabant wallon, ORES Est, ORES Hainaut, ORES Luxembourg, ORES Mouscron, ORES Namur, ORES Verviers) and RESA¹⁵. For network costs - transmission and distribution tariffs for profile E1 - we will hence present a weighted average of the values for all DSOs. For simplification reasons, only DSO tariffs for Wallonia from ORES and RESA were taken into account (amounting to 96,34% of all distributed electricity in Wallonia at the end of 2016). In other words, 3 smaller independent or 'cross-regional' DSOs were not taken into account in our weighted average: AIEG, AIESH, and Régie de Wavre. It should be noted that TRANS MT (instead of TRANS HT) is the highest tension level for ORES and RESA in Wallonia.

DSOs of the Walloon region	Electricity distributed MWh (2016) ¹⁶	Market share
Ores Hainaut	4.369.000	29,40%
RESA	3.465.000	23,31%
Ores Namur	1.726.000	11,61%
Ores Brabant wallon	1.506.000	10,13%
Ores Luxembourg	1.194.000	8,03%
Ores Mouscron	879.000	5,91%
Ores Verviers	679.000	4,57%
Ores Est	501.000	3,37%
Subtotal	14.319.000	96,34%
AIEG	220.000	1,48%
AIESH	176.000	1,18%
Régie de Wavre	148.000	1,00%
Total	14.863.000	100%

The DSO for electricity in the Brussels region is Sibelga. It should be noted that TRANS MT is the highest tension level for Sibelga in the Brussels region.

The first impact is caused by regional public service obligations that are a consequence of the grid connection levels which are summarised in the table below. The regions can impose public service obligations on grid operators below or equal to 70 kV located on their territory (impacts profile E1 and E2).

Voltage	Operator in charge	Operator in Belgium
< 30 kV	Distribution System Operator (DSO)	Several
30 kV < x < 70 kV	Local Transmission System Operator (LTSO)	Elia in the 3 regions
> 70 kV	Transmission System Operator (TSO)	Elia (federal)

The second regional impact within Belgium is caused by the certificate schemes which results from the regional competence in terms of renewable energy obligations on their territory. Flanders, Wallonia and the Brussels-Capital region each impose their own green certificate scheme on all electricity consumers within their region (all profiles under review).

Apart from looking at the Belgian case through the three regional cases, we also make several other assumptions: the four electricity consumers under review are part of an energy efficiency agreement and belong to the sectoral NACE-BEL classification codes 5-33 (all industry).

¹⁵ PBE and GASELWEST used to be included in the research but have stopped operating in Wallonia respectively in January 2018 and January 2019. Their activities in Wallonia were respectively transferred to ORES Brabant Wallon and ORES Mouscron.

¹⁶ Figures from CWAPE



Germany

Within the German territory, consumers can take part in one single electricity market. Therefore, we assume that the commodity cost is equal for Germany as a whole. As far as taxes, levies and certificate schemes are concerned, we observe no regional differences for electricity consumers, not even for the local taxes¹⁷.

On the German territory, four different TSOs are active; their corresponding geographical coverage is depicted below.



- 1. The <u>West region</u> which is made of Nordrhein-Westfalen, Rheinland-Pfalz and Saarland, where Amprion is the TSO.
- 2. The <u>South-West region</u> which is made of Baden-Württemberg where Transnet BW is the TSO.
- 3. The <u>Central region</u> which is made of Niedersachsen, Hessen, Bayern, Schleswig-Holstein and where Tennet operates the transmission grid.
- 4. The *East region* which is made of former East-Germany and Hamburg; 50 Hertz operates the transmission grid in this region.

Given the geographical and economic importance of these four zones (even the smallest one has as many inhabitants as Belgium as a whole), it is logical to treat these four zones the same way we treat the three Belgian regions. They will hence be analysed separately.

As it is the case in Belgium, profiles E1 and E2 will also pay a distribution cost (explained in further detail in section 4.2). As Germany counts about 878 distribution system operators¹⁸, and as distribution and transmission tariffs are integrated (two layers presented in one single tariff), the four transmission zones remain the most relevant way of presenting the results for Germany. For profile E1 and E2, we will therefore present an average of the distribution tariffs of two large

¹⁷ The Konzessionsabgabe is a local tax that applies to all electricity consumers connected to the distribution grid, but it is fixed on a national level and capped at one single rate for industrial consumers (*Konzessionsabgabenverordnung*, *§* 1-2).

¹⁸ Monitoring Report 2017, Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen, 2017, pg.34.



(one rural and one urban) DSOs from each of the four transmission zones, similar to what has been done for the gas market.

France

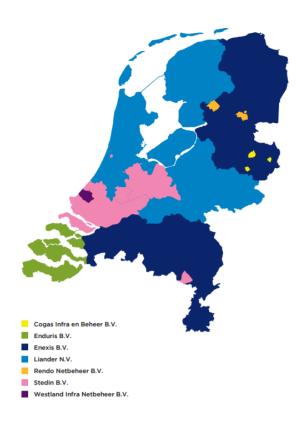
In terms of electricity market, France will be treated as one single zone. The same commodity cost, transmission tariffs (transmission tariffs in France start at a connection level of 1 kV and hence include all consumer profiles under review) and taxes and levies apply everywhere on the national territory for the four consumer profiles under review.

The Netherlands

The Netherlands will also be treated as one single zone in this study. In terms of commodity costs and taxes, levies and certificates schemes, no regional differences are observed: there is one single electricity market and the taxes on electricity are only imposed on a national basis.

On the network cost level, the situation is somewhat more complex. The Netherlands counts only one TSO: TenneT. For this reason, the tariff methodology implemented is the same throughout the national transmission grid. Therefore, the network cost for the two largest consumer profiles (E3 and E4) consists out of the transmission tariffs imposed by TenneT. On the contrary, in the Netherlands, profiles E1 and E2 are connected to the Dutch distribution grid, which covers the entire grid below the 110 kV voltage level. Hence, the network cost for profiles E1 and E2 will consist out of the distribution tariffs imposed by the DSOs.

The Dutch distribution network counts seven different DSOs¹⁹ of different size and importance (see map below), each of which applying different tariffs. As it is the case in Germany, these distribution costs are integrated with transmission costs (two layers integrated in one cumulative tariff).



¹⁹ Edinet Eindhoven has been integrated in Enexis as of 1st of January 2017.



These DSOs are characterised by differences in size and number/type of clients. For profiles E1 and E2, we will therefore present a weighted average of distribution tariffs in accordance with the number of grid connections for every DSO. An overview of their number of connections (and hence their market share) can be found in the table below.

DSO	Number of connections (2016) ²⁰	Market share
Liander	2.950.296	36,13%
Enexis ²¹	2.778.347	34,03%
Stedin	2.081.144	25,49%
Enduris	213.280	2,61%
Westland	57.224	0,70%
Cogas	53.155	0,65%
Rendo	32.248	0,39%
Total	8.165.694	100%

Liander, Enexis and Stedin have a combined market share of almost 96%. Therefore, their tariffs have a high impact on the weighted average used for distribution tariffs for profiles E1 and E2.²²

United Kingdom

As it is the case for France and the Netherlands, the United Kingdom will also be treated as one single zone in this study. In terms of commodity costs and taxes, levies and certificates schemes, no regional differences are observed: there is one single electricity market and the only taxes on electricity are imposed on a national basis.

In terms of network costs, the United Kingdom has three transmission system operators:

- 1. National Grid (for England and Wales);
- 2. Scottish Hydro Electric Transmission (SHET);
- 3. Scottish Power Transmission (SPT).

On top of these three transmission system operators, six distribution system operator groups are active²³. The TSOs and DSOs all charge different tariffs in the same fourteen tariff zones in the UK (without Northern Ireland).

²⁰ The number of connections are those from 2016, collected by Netbeheer Nederland and Gasunie Transport Services. For more details see the Energietrends 2016 rapport.

²¹ The number of connections of Endinet Eindhoven are added to those of Enexis.

²² Cogas and Rendo do not provide electricity to consumers of profile E1, while Enexis, Liander and Stedin are the only DSOs providing electricity to consumers of profile E2.

²³ In addition to these large DSOs, the UK also has some smaller Independent Network Operators (IDNO's). These are not taken into account in this study.



ELECTRICITY DISTRIBUTION NETWORKS

•	Scottish and Southern Energy Power Distribution	TSO	DSO	Zones
	Run the low voltage electricity distribution network in the North of Scotland and South of England. SP Energy Networks	3	6	14
A State	Run the low voltage electricity distribution network in the South of Scotland and North Wales.	Scottish Hydro	Scottish and	Northern Scotland
W St.	Electricity North West Run the low voltage electricity distribution network in the North West.	Electricity Transmission	Southern Energy Power	
•	Northern Powergrid Run the low voltage electricity distribution network in the North East and Yorkshire.	(SHE)	Distribution	Southern
3	UK Power Networks Run the low voltage electricity distribution network in the East of England, London and South East.	Scottish Power Transmission	SP Ene rgy	Southern Scotland
14/1	Western Power Distribution Run the low voltage electricity distribution network in the East and West Midlands, South Wales and	(SPT)	Networks	North Wales & Mersey
	South West of England.		Electricity North West	North West
			Northern	Northern
			Power Grid	Yorkshire
		National Grid Electricity Transmission	UK Power Network Western Power Distribution	Eastern
				London
2 6 8				South East
		(NGET)		East Midlands
				Midlands
				South Wales
				South Western

For network costs - transmission tariffs for profiles E3 and E4, transmission and distribution tariffs for profiles E1 and E2 - we will hence present average values for all fourteen zones.

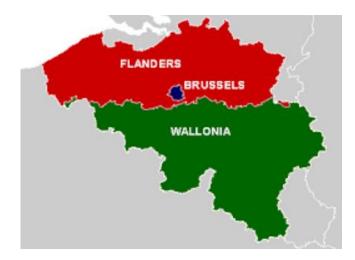
As to taxes and levies, we assume that industrial consumers considered in this study are all part of a Climate Change Agreement.



3.4 Gas: Countries/zone(s) identified

Belgium

In terms of commodity cost and transmission cost, no regional differences are observed in Belgium. The same commodity prices on the gas market are available to all consumers. Belgium counts only one Transmission system operator: Fluxys Belgium. About 230 clients are directly connected to the transmission system, and profile G2 is assumed to be part of this group of directly connected clients.²⁴



We take as assumption that profile G1 is a T6 category consumer on the distribution grid (T6²⁵). The Flemish region has 11 DSOs for gas including 10 that are operated by FLUVIUS in addition to Exenis²⁶, whilst in the Walloon region (6 DSOs) the distribution grid is operated by ORES and RESA²⁷. We will present a weighted average of the distribution tariffs in each of the regions, based on the volume of gas distributed on each of their grids. The DSO for gas in the Brussels region is Sibelga.

DSOs of the Flemish region	Gas distributed MWh (2016) ²⁸	Market share
Gaselwest	10.730.460	16,95%
Iveka	10.139.473	16,02%
Iverlek	10.130.688	16,01%
Imewo	9.503.529	15,02%
Imea	6.769.291	10,69%
Inter-Energa	6.946.293	10,98%
Intergem	4.648.007	7,34%
Iveg	2.076.996	3,28%
Sibelgas	1.088.582	1,72%
Infrax West	1.211.980	1,91%
Enexis	49.049	0,08%
Total	63.294.348	100%

None of these clients directly connected to the transport grid is located in the Brussels Capital Region.
For Sibelga, the DSO of the Brussels-Capital Region, the category in question is T5 due to the fact that

⁵ For Sibelga, the DSO of the Brussels-Capital Region, the category in question is T5 due to the fact that the former national AMR categories T5 (<10 GWh/year) and T6 (>10 GWh/year) were regrouped in accordance between Sibelga and their regional regulator Brugel.

²⁶ Enexis active in the Belgian enclave of Baarle-Hertog, is not considered in the study.

²⁷ Gaselwest no longer operates in Wallonia since January 1st 2019.

²⁸ Figures from VREG.



DSOs of the Walloon region	Gas distributed MWh (2016) ²⁹	Market share
Ores Hainaut	7.319.140	37,25%
RESA	5.857.040	29,81%
Ores Brabant wallon	2.663.370	13,55%
Ores Mouscron	2.150.300	10,94%
Ores Namur	1.179.770	6,01%
Ores Luxembourg	479.790	2,44%
Total	19.649.410	100%

In terms of taxes and levies, however, some (very) small differences exist between regions. This is why we present the results for Belgium in the same way we did for electricity: a separate analysis for Flanders, Wallonia and the Brussels-Capital region.

Germany

The only component of the gas price for our profiles under review that does not show any regional differences is the taxes and levies component.

In terms of commodity price, there are two market areas in Germany³⁰: *Gaspool* and *Netconnect Germany (NCG)* and eleven different transmission system operators. Each of them is mainly active in one market area, but some of them are active in both.



- 1. In the *Gaspool* area, the following operators are active: Gascade Gastransport, GTG Nord, ONTRAS Gastransport, Nowega and Gasunie.
- 2. *NetConnect Germany (NCG)* counts the following TSOs in its area: Bayernets, Fluxys TENP, GRTgaz, Terranets BW, Thyssengas and Open Grid Europe.

Given the fact that we observe an advanced form of convergence between the Gaspool and NCG-market prices, and given the amount of different TSOs, we will present one single result for Germany. In terms of commodity, we will present the average of Gaspool and NCG-prices. Concerning network costs, we will base the

²⁹ Figures from VREG.

³⁰ https://www.fnb-gas.de



evaluation of the tariffs for profile G2 on the average of the exit tariffs of 11 TSOs serving directly connected industrial clients.

As our profile G1 is directly connected to the distribution grid, it will pay a distribution cost and therefore its network cost will be based upon the distribution tariffs imposed by the DSOs. As there are 717 different DSOs in Germany³¹ we will present an average of the distribution tariffs of two large rural and two large urban DSOs from each of the two market areas, similar to what has been done for the electricity market.

France

France has only one market area for gas and two different transmission system operators.

As shown on the map below, the two transmission system operators (TSO) are:

- 1. *GRTGaz*, operating respectively in the North of the country and in the central and South-Eastern regions.
- 2. TEREGA³², concentrated on the South-Western region.

Within France, there is one gas market³³: TRF (Trading Region France). TRF became the unique gas market on November 1st 2018 when PEG Nord and TRS merged. TRS used to exist since 1st of April 2015 as the result of a merger between the PEG Sud-market (the Central and South-Eastern regions that are operated by GRTGAZ) and the South-Western region operated by TEREGA.³⁴³⁵



As we used to observe substantial differences between the different transport tariffs and between the commodity prices in the former market areas, the French result were presented in three different price zones: GRTGaz/Nord (representing about 75% of gas consumption in France), GRTGaz/Sud (about 20%) and TEREGA (about 5%)³⁶. Yet, as there exists only one market area nowadays, we present the results as a unique price zone. For the sake of comparison, we present results prior to the unique market area based on weighted averages. Concerning commodity prices,

35 <u>http://www.u-tech.fr/actualites/coupuresgaz2013</u>

³¹ Monitoring Report 2017, Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen, 2017, pg.276.

³² TIGF became TEREGA in April 2018.

³³ Towards a French single marketplace for gas in 2018, GRTgaz and TIGF, GRTgaz and TIGF

³⁴ https://www.gazprom-energy.fr/gazmagazine/2015/04/trs-le-peg-sud-et-le-tigf-ont-fusionne/

³⁶ CRE, Marchés de gros: Observatoire des marchés de l'électricité, du gaz et du CO2, 3^{ième} trimestre 2014.



North and South regions are weighted based on their annual volume consumption whereas network costs are weighted based on TSOs' annual offtakes. In terms of distribution, GRDF (Gaz Réseau Distribution France) distributes 96% of all gas³⁷ in France.

The Netherlands

The Netherlands counts one single gas market (TTF), where all gas entering the Dutch transport system is being traded. The TTF was established in 2003 in order to concentrate trade of gas in one marketplace. Furthermore, the Dutch gas market does not impose any regional taxes on gas, and has one Transmission System Operator: Gasunie Transport Services. About 300 industrial clients are directly connected to the gas transmission grid, and we assume profiles G1 and G2 are part of this group³⁸. For both profiles we will hence, logically, present the Netherlands as one single zone.

United Kingdom

The United Kingdom will be presented as one single zone for gas in this study (leaving out Northern Ireland). There is one single gas market (NBP: National Balancing Point), there are no regional taxes, and there is one single gas transmission system operator, *National Grid Gas plc*³⁹.



On top of the transmission system operator, there are eight gas distribution networks. These eight networks are owned and managed by the following companies:

- i. Cadent Gas⁴⁰ (West Midlands, North West England, East of England and North London);
- ii. Northern Gas Networks (North East England including North East, North, West and East Yorkshire and Northern Cumbria);
- iii. Wales & West Utilities (Wales and South West England);

³⁷ <u>http://www.cre.fr/reseaux/infrastructures-gazieres/description-generale#section3</u>

³⁸ Gasunie Transport Services is obliged by the Gas Act (Article 10, paragraph 6b) to provide a direct connection point when the applicant has a flow rate greater than 40 m³(n) per hour (equal to 350.400 m³ per year).

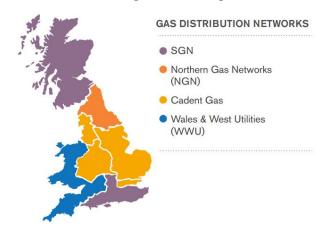
³⁹ https://www.nationalgrid.com/

⁴⁰ National Grid Gas became Cadent Gas in May 2017.



iv.

SGN (Scotland and Southern England including South London).



In addition, there are a number of smaller networks owned and operated by Independent Gas Transporters, which are not taken into account in this study.



3.5 Summary table on number of zones per country

Table 1 – Summary table on number of zones per country

Country	Number of zones	
	Electricity	Gas
Belgium	3	3
Germany	4	1
France	1	1
The Netherlands	1	1
United Kingdom	1	1
Total	10	7

4. Electricity: Detailed description of the prices, price components and assumptions



4. Electricity: Detailed description of the prices, price components and assumptions

4.1 Belgium

Component 1 - the commodity price

Commodity prices in Belgium are calculated based on market prices and represent the cost of electricity consumed by industrial consumers in January 2019. The national indexes used in the calculation of the commodity price are the ICE Endex CAL and the Belpex DAM.

The commodity formula is applied to all profiles. For profiles E1 and E2, we use all hours except weekends of Belpex DAM, whilst for profiles E3 and E4 we use all hours of Belpex DAM.

The formula used for pricing commodities in this study was provided by the CREG and is based on an analysis by the Belgian regulator of the electricity supply contracts of all Belgian consumers with an annual consumption above 10 GWh, dating back to 2014. In order to ensure comparative results and after stakeholder consultation, it was decided in agreement with the CREG to maintain this formula.

Commodity price

 $= 47,1\% \ CAL \ Y_{-1} + 20,1\% \ CAL \ Y_{-2} + 7,1\% \ CAL \ Y_{-3} + 7,8\% \ Qi_{-1} + 2,2\% \ Mi_{-1} + 15,7\% \ Belpex \ DAM$

where:

	Explanation
CAL Y ₋₁	Average year ahead forward price in 2018
CAL Y ₋₂	Average two year ahead forward price in 2017
CAL Y ₋₃	Average three year ahead forward price in 2016
Qi ₋₁	Average quarter ahead forward price in the fourth quarter of
	2018
Mi ₋₁	Average month ahead forward price in December 2018

Component 2 - network costs

Transmission cost

Whether connected to the transmission grid 30-70 kV (Local Transmission System) or to the transmission network itself, the same transmission tariff structure applies to all profiles under review in this study. However, in function of the voltage connection and used capacity, different rates apply.

Transmission costs in Belgium have five components:

- 1. *Connection tariffs*: in this case, the study only takes into account the charges to operate and maintain the user connection;
- 2. *Tariffs for the management and the development of the grid infrastructure:* this cost includes (i) the tariff for the monthly peak for the offtake, (ii) the tariff for the yearly peak for the offtake and (iii) the power put at disposal;



- 3. *Tariffs for the management of the electric system*: this cost includes (i) the tariff for the management of the electric system and (ii) tariffs for the offtake of additional reactive energy (not taken into account);
- 4. *Tariffs for the compensation of imbalances*: this cost includes: (i) the tariff for the power reserves and black-start and (ii) the tariff for the maintenance and restoring of the residual balance of the individual access responsible parties. The latter includes (a) imbalance tariffs, which are not taken into account as they are (generally) not explicitly billed by the TSO or by suppliers to end consumers and (b) network losses. In Belgium, network losses on the federal transport grid (380/220/150 kV) make for an additional and separate component of transport tariffs. They are generally billed by the supplier as a percentage (fixed every year by the TSO) of the commodity cost. Even though they are not part of the transmission tariff structure as such, we consider these network losses and their cost as part of component 2 (network costs);
- 5. *Tariffs for market integration:* this cost relates to services provided by Elia such as the development and integration of an effective and efficient electricity market, the operation of interconnections, coordination with neighbouring countries and the European authorities and publication of data as required by transparency obligations.

Distribution costs

For profile E1 connected to the distribution grid (at 26-36 kV), distribution tariffs have to be added to the transmission tariffs. In our study, we select the tariffs for the highest voltage level networks on the distribution grid (i.e. TRANS HS/ TRANS HT)⁴¹. For each Belgian region, distribution tariffs typically have three components:

- 1. Tariffs for power put at disposal⁴²;
- 2. Tariffs for system management;
- 3. Metering cost.

For each region of Belgium, we compute the tariff through a weighted average of each component across all DSOs active in the region (weights are given in terms of distributed electricity per DSO in 2016). As previously stated, for the Flemish region, all DSOs operated by FLUVIUS were taken into account (representing 100% of distributed electricity in the region in 2016). For the Walloon region, all DSOs operated by ORES and RESA were taken into account (representing 96,3% of distributed electricity in the region in 2016).

However, RESA is the sole DSO to have adopted a different distribution tariff structure in January 2019. As other DSOs will only adopt this structure as of March 1st 2019, 2018 extended tariffs are of application on January 2019 and were therefore used for those DSOs. Although it remains a three-component structure, it is composed as follows:

- 1. Fixed component,
- 2. Proportional component,

⁴¹ TRANS MT is the highest voltage level for RESA, ORES and Sibelga networks, which we use in the scope of this study.

¹² Given the voltage level networks of distribution grid we consider (TRANS HS in Flanders, TRANS MT in Wallonia and Brussels), different methodologies are applied with regards to distribution tariffs. In the Walloon region, there are different methodologies for ORES and RESA concerning the distribution tariff component of power put at disposal (upper boundary for RESA and standard formula for ORES). For the Flemish region, there are different methodologies concerning the distribution tariff component of power put at disposal (upper boundary for DSOs formerly operated by INFRAX and standard formula with a smoothing coefficient for DSOs formerly operated by EANDIS). In the Brussels region, the power put at disposal component of the distribution tariff is based on a standard formula.



3. Capacity component.

It should be noted that regional regulators have different timings in terms of adoption of transmission tariffs and federal contributions (see table below).

Adoption of new tariffs by regional regulators	Transmission	Federal contribution
VREG	1/3/2019	1/1/2019
BRUGEL	1/1/2019	1/1/2019
CWAPE	1/3/2019	1/3/2019

Hence, as the period analysed in the scope of this study is the month of January 2019, some transmission tariffs (Flanders, Wallonia) as well as the rates for the federal contribution (Wallonia) were taken into account at their 2018 level, still applicable in the first months of 2019. This is the case for the adoption of transmission tariffs by the VREG and the adoption of transmission tariffs and federal contribution by the CWAPE. This explains the differences in federal contribution between the three Belgian regions. Another element to be highlighted is the fact that for profile E1, federal public service obligations as well as federal taxes and levies vary across the three regions due to DSO network losses, which vary between different individual DSOs.

Component 3 - all extra costs

In Belgium, three different kinds of extra costs apply to electricity, detailed below:

- 1. **Tariffs for Public Service Obligations (PSO)**: eight different public service obligations apply to the profiles under review. The first three (a-b-c) are imposed on Elia as TSO (and hence apply to all profiles under review), the four (d-e-f-g) next ones are imposed on DSOs and on Elia as LTSO (and hence only apply to profiles E1 and E2), and the last one applies for consumers connected to the distribution grid (E1):
 - a. Financing of connection of offshore wind power generation units (0,1613 €/MWh);
 - b. Financing of federal green certificates (offshore wind) (7,2875€/MWh) but discount and cap based on quantity apply;
 - c. Financing of Strategic Reserves (0,000€/MWh);
 - d. Financing of support measures for renewable energy and cogeneration in Flanders (0,3621 €/MWh) but discount based on quantity applies (only E1 and E2);
 - e. Financing measures for the promotion of rational energy use in Flanders (0,0000 €/MWh) (only E1 and E2);
 - f. Financing support measures for renewable energy in Wallonia (13,8159 €/MWh) but discount based on quantity applies (only E1 and E2);
 - g. Financing regional energy policies in Brussels (0,9300 €/kVA/month) but only due up to 5.000 kVA/month (only E1 and E2);
 - h. Public service obligations for consumers connected to the distribution grid⁴³ i.e. (i) public service obligations in Flanders, (ii) public service obligations in Wallonia; (iii) public service obligations in Brussels (only E1).

⁴³ For each region of Belgium, we compute the tariff through a weighted average of each component across all DSO active in the region (weights are given in terms of distributed electricity per DSO in 2016). As stated above, for the Flemish region, all DSOs operated by FLUVIUS were taken into account (representing 100% of distributed electricity in the region in 2016). For the Walloon region, all DSOs operated by ORES and RESA were taken into account (representing 96,3% of distributed electricity in the region in 2016).



- 2. *Taxes and levies* on the federal and on the regional levels. We can identify five different taxes and levies:
 - a. Federal contribution (3,3461 €/MWh for profiles E2 to E4), increased by 1,1% to pay for supplier administrative costs, no exemption but discount and cap based on quantity apply. Customers under profile E1 are subject to tariffs charged by the DSOs (3,447 €/MWh in Wallonia and 3,349 €/MWh in the Brussels region). ⁴⁴
 - b. Energy contribution (1,9261 €/MWh) with two different tariffs :
 - 1,9261 €/MWh for non-professional use and end-users with a connection to the transmission or distribution grid below 1kv.
 - 0 € for end-users with a connection to the transmission or distribution grid above 1kv.

Profiles under review for this study fall in the latter category; we therefore consider that the energy contribution is not charged to these customers.

- c. Levy for occupying public domain in Wallonia (0,334€/MWh), which is only applicable to the local transport network and below (only E1 and E2);
- d. Levy for occupying road network in Brussels (3,4642 €/MWh);45
- e. Levy for the taxes "pylons" and "trenches" in Flanders (0,0933 €/MWh);
- f. Connection fee in Wallonia (0,3000 €/MWh);
- g. The *Energieheffing* or *Bijdrage Energiefonds* was introduced in the Flemish region in January 2015 as a surcharge on electricity offtake points. While it was reformed in March 2016 to an annual fee, the Constitutional Court cancelled this conversion in June 2017. Since January 2018, it is charged as a fixed monthly fee. In 2019, it amounts to 153,63€ for consumers on the medium voltage grid (E1) and 896,18€ for consumers on the high voltage grid (E2, E3 and E4).

3. Certificate schemes and other indirect costs.

Firstly, there are the indirect costs that are comprised within the electricity price, as a consequence of the regional quota for green certificates (three regions) and combined heat/power-certificates (only Flanders).

To estimate the cost of this mechanism, we take into account the average market price of the certificates over the last 12 months, which means for 2019 from 1st of January 2018 until 31st of December 2018⁴⁶. The average values for each region taken into account are presented in the table below and are based on figures retrieved from the respective regional regulators:

⁴⁴ Since July 1st 2018 and until the end of 2019, discount rates (variable across DSOs) apply in Flanders to offset the excess amount of money perceived by DSOs as a consequence of increasing transmitted electricity due to larger renewable energy production.

⁴⁵ For this fee, the regional legislator introduced a cap starting January 1st 2007 (no fee due on electricity above 25 GWh/year), but the decree to make it applicable has not been issued so far. As a consequence, this ceiling is not applied in Brussels (source: Ordonnance du 14 décembre 2006 modifiant les ordonnances du 19 juillet 2001 et du 1er avril 2004 relatives à l'organisation du marché de l'électricité et du gaz en Région de Bruxelles-Capitale et abrogeant l'ordonnance du 11 juillet 1991 relative au droit à la fourniture minimale d'électricité et l'ordonnance du 11 mars 1999 établissant des mesures de prévention des coupures de gaz à usage domestique, article 102).

⁴⁶ This approach differs from the one that was deployed in our 2016 and 2017 reports, when the indirect costs of the regional quota for green certificates was estimated at 85% of the penalty a supplier has to pay for not meeting the quota. This new approach is applied in a consistent manner to the cost of green certificates in 2016 and 2017 in order to increase comparability between the results of the previous years.

Region	2016 (€/MWh)	2017 (€/MWh)	2018 (€/MWh)	2019 (€/MWh)
Flanders (GC) ⁴⁷	89,64	88,91	88,80	90,25
Wallonia (GC) ⁴⁸	67,80	66,70	66,06	65,92
Brussels-Capital Region (GC) ⁴⁹	82,59	83,00	87,39	93,10
Flanders (CHPC) ⁵⁰	22,03	21,01	19,82	20,67

To estimate the cost of this mechanism, we also take into account the quotas and some associated reductions:

a. Flanders (green certificates): the quota increased nearly every year (except in 2017) since the introduction but will now remain identical for the coming years. Important progressive quota reductions apply to all industrial consumers.

Additionally, for the quota relative to electricity supplied in 2019, the socalled **super cap** was introduced.⁵¹ This means that:

- The amount due for the costs related to the financing of renewable energy is capped at 0,5% of gross added value (average last 3 years) for all consumers with an electro-intensity over 20% for consumers belonging to sectors that are listed in annexes 3 and 5 of the EEAG⁵²;
- The amount due for the costs related to the financing of renewable energy is capped at 4% of gross added value (average last 3 years) for all consumers belonging to sectors that are listed in annex 3 of the EEAG;
- b. Flanders (combined heat/power certificates): the quota increased every year from introduction to 2016 but remain steady ever since and for the coming years. Important progressive reductions apply to all industrial consumers;
- c. Wallonia: the quota increases every year. Progressive quota reductions apply to large consumers, reinforced by the new regional decree that entered into force on July 1st 2014;
- d. Brussels: the quota increases every year. No quota reductions for large consumers exist.

Secondly, there are additional taxes and levies apply for consumers who are connected to the distribution grid in each of the three regions which comprise of (i) expenses and unfunded pensions, (ii) income tax and (iii) other local, provincial, state and federal taxes, levies, charges, contributions and payments (only for E1)⁵³.

⁴⁷ Figures can be retrieved on the VREG's website: <u>https://infogram.com/bilateraal-gsc-1hor6rroyy8l6ek</u>

⁴⁸ Figures can be retrieved on the CWAPE's website: <u>https://www.cwape.be/?dir=3.4.11</u>

⁴⁹ Figures can be retrieved on the BRUGEL's website: https://www.brugel.brussels/publication/document/statistiques/2019/fr/Observatoire-T4-1-FR.pdf

⁵⁰ Figures can be retrieved on the VREG's website: <u>https://infogram.com/bilateraal-wkk-1hmr6glmxxlo4nl</u>

⁵¹ Vlaams Energiedecreet, art. 7.1.10 §3/1.

⁵² Environmental and Energy State Aide Guidelines, Communication C200/50 of the European Commission.

⁵³ For each region of Belgium, we compute the tariff through a weighted average of each component across all DSOs active in the region (weights are given in terms of distributed electricity per DSO in 2016). As stated above, for the Flemish region, all DSOs operated by FLUVIUS were taken into account (representing 100% of distributed electricity in the region in 2016). For the Walloon region, all DSOs operated by ORES and RESA were taken into account (representing 96,3% of distributed electricity in the region in 2016).

4.2 Germany

Component 1 - the commodity price

Commodity prices in Germany are calculated based on market prices and represent the cost of electricity consumed by industrial consumers in January 2019. The national indexes used in the calculation of the commodity price are the EEX Futures and EPEX DAM prices.

The commodity formula is applied to all profiles. For profiles E1 and E2, we use all hours except weekends of EPEX DAM, whilst for profiles E3 and E4 we use all hours of EPEX DAM.

The formulas used for pricing commodities in this study was provided by the CREG and are based on an analysis by the Belgian regulator of the electricity supply contracts of all Belgian consumers with an annual consumption above 10 GWh, dating back to 2015. In order to ensure comparative results and after stakeholder consultation, it was decided in agreement with the CREG to maintain this formula.

Commodity price

 $= 47,1\% \ CAL \ Y_{-1} + 20,1\% \ CAL \ Y_{-2} + 7,1\% \ CAL \ Y_{-3} + 7,8\% \ Qi_{-1} + 2,2\% \ Mi_{-1} + 15,7\% \ EPEX \ Spot \ DE$

where:

	Explanation
CAL Y ₋₁	Average year ahead forward price in 2018
CAL Y ₋₂	Average two year ahead forward price in 2017
CAL Y ₋₃	Average three year ahead forward price in 2016
Qi ₋₁	Average quarter ahead forward price in the fourth
	quarter of 2018
Mi ₋₁	Average month ahead forward price in December 2018

Component 2 - network costs

The German electricity grid organization is fairly different from the Belgian one. The four transmission grid operators only operate the (extra-) high voltage grid, while everything else (often, but not always, up to 110 kV) is operated by the distribution system operators.

Connection voltage (U _n)	Voltage profile	Consumer profile	Grid operator	
$1 \text{ kV} \le \text{U}_n \le 50 \text{ kV}$	Medium voltage	E1		
1 KV S ON S 30 KV	Wedfulli Voltage	_	DSO	
		E2		
Un = 110 kV	High Voltage			
		E3		
220 kV < U _n ≤ 350 kV	Extra high voltage	Ū	TSO	
		E4		

For the first profile (E1), we assume the consumer benefits from the medium voltage tariff on the distribution grid, while the second profile (E2) benefits from the 'Umspannung in Mittelspannung' tariff on the distribution grid. Profile E3 is assumed to be directly connected to the 'Umspannung in Hochspannung' high voltage transformation grid, while profile E4 is assumed to be directly connected to the extra high voltage grid. Both the 'Umspannung in Hochspannung' and extra high voltage grid are operated by the TSO.

Transmission and distribution tariffs in Germany are integrated and presented as one single tariff to the consumers on the distribution grid. As stated in the



description of the dataset, we present results for the four transmission zones in Germany. As Germany counts about 878 distribution system operators⁵⁴, the network cost we present for profiles E1 and E2 is an average of two large DSOs in each transmission zone (one rural, one urban DSO).

Transmission costs

German integrated grid fees, imposed on transmission grid, follow the same methodology and involve three main components:

- 1. *Annual capacity charge*: depends upon the maximum capacity in kW contracted, expressed in €/kW per year;
- 2. *Energy charge*: depends upon the volume of energy consumed in kWh per year, expressed in ct/kWh per year;
- 3. *Metering costs:* charges related to the cost of metering and invoicing, fixed prices expressed in € per year.

Other fees, such as capacity excess fees are not taken into account in this study given the assumption that load profiles do not exceed their contracted capacity.

When annual consumption exceeds 10 GWh, important transmission network costs reductions can apply on large industrial consumers⁵⁵. Users with a very abnormal load profile (case by case)⁵⁶ get a reduction of max. 90%. Moreover, users who exceed 7.000 consumption hours a year, benefit from reductions as shown in the table below:

Annual consumption	Annual offtake hours	Grid fee reduction	
> 10 GWh	≥ 7.000 hrs	- 80%	
> 10 GWh	≥ 7.500 hrs	- 85%	
> 10 GWh	≥ 8.000 hrs	- 90%	

These reductions apply to profiles E3 and E4. We assumed that Profile E3 has a profile of 7.692 hours and pays consequently only 15% of the grid fee, while this is only 10% for profile E4 (8000 consumption hours)⁵⁷.

The costs can be allocated pro rata to final consumers as a surcharge on network charges.

Distribution costs

German distribution grid fees follow a similar methodology as those of the transmission grid but have a different terminology. Although every DSO imposes different rates for different ranges of both maximum capacity contracted and electricity consumed, their tariffs involve the same three components:

Capacity charge (i.e. "*Leistungspreis*"): depends upon the maximum capacity in kW contracted, expressed in $\mathbb{C}/kWh/h$ per year;

Consumption charge (i.e. *"Arbeitspreis"*): depends upon the volume of energy consumed in kWh per year, expressed in ct/kWh per year;

⁵⁴ Monitoring Report 2017, Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen, 2017, pg.34.

⁵⁵ Stromnetzentgeltverordnung, §19, abs. 2.

⁵⁶ In accordance with §19, section 2 S. 1 StromNEV, the TSOs are required to offer an end consumer, in deviation from § 16 StromNEV, an individual grid charge if, based on existing or forecasted consumption data or based on technical or contractual circumstances, it is apparent that the peak load of an end consumer foreseeably deviates considerably from the simultaneous annual peak load of all sampling of this grid or transformer level.

⁵⁷ Consumption of 100GWh/year divided by peak capacity of 13.000 kW = 7692 peak load hours; Consumption of 500GWh/year divided by peak capacity of 62.500 kW = 8000 peak load hours.



Metering costs: charges related to the cost of metering and invoicing, fixed prices expressed in \in per year.

Component 3 - all extra costs

Regarding taxes and levies, the German situation is particularly complex, with a host of progressive reductions, diversified rates and exemptions. As laid out in the general assumptions, we assume our consumer is an economically rational actor and aims at obtaining the lowest tax rate. Whenever the application of reductions or exemptions depends on economic criteria that are not under the full control of the user (energy cost/turnover, energy cost/gross added value, pension payments, etc.), we will present a range with all possible options.

In Germany, seven taxes/surcharges can apply on electricity:

1. The *Combined heat & power generation surcharge* (CHP) is a surcharge that pays for CHP-plant subsidies. The calculation is based on present forecast data of DSOs and the Federal office for Economic Affairs and Export Control (BAFA). There are three different rates for the three following consumer groups:

Category	Consumer Group	Rates
Category A	All other consumers	2,8 €/MWh
Category B	 If consumption > 1 GWh / year and electricity cost is : For an extensive list of industrial sectors (annex 3 of EEAG)⁵⁸: >17% of gross added value⁵⁹ For a less extensive list of industrial sectors (annex 5 of EEAG) : >20% of gross added value 	 0,42 €/MWh (85% reduction), but capped⁶⁰ at 0,5% of gross added value (average last 3 years) for all consumers with electricity cost >20% of gross added value 4,0% of gross added values (average last 3 years) for all consumers with electricity cost 20% of gross added values
Category C	If consumption > 1 GWh / year and electricity cost is : For an extensive list of industrial sectors (annex 3 of EEAG) ⁶¹ : between 14 and 17% of gross added value (avg. last 3 years)	 0,56 €/MWh (80% reduction), but capped⁶² at 0,5% of gross added value (average last 3 years) for all consumers with electricity cost >20% of gross added value 4,0% of gross added values (average last 3 years) for all consumers with electricity cost <20% of gross added value

The consumers that benefit from the bottom rate of the EEG (see further) also have a bottom rate of 0,3 C/MWh for the KWKG.

For the four consumer profiles under review, we present a range from the bottom rate to the category C rate.

 $^{^{58}}$ Environmental and Energy State Aide Guidelines, Communication C200/50 of the European Commission.

⁵⁹ The notion of gross added value is defined in Annex 4 of the Environmental and Energy State Aide Guidelines, Communication C200/50 of the European Commission.

⁶⁰ However, these caps are only applicable if the consumer is part of an energy efficiency system improvement program.

⁶¹ Environmental and Energy State Aide Guidelines, Communication C200/50 of the European Commission.

⁶² However, these caps are only applicable if the consumer is part of an energy efficiency system improvement program.



2. The *"StromNEV"* §19-Umlage, which is a digressive levy to compensate for the §19 transmission tariff reductions. Different rates apply to different bands of total electricity offtake.

Band	Electricity offtake	Rates
Band A	Offtake \leq 1 GWh/year	3,05 €/MWh
Band B	Offtake > 1 GWh /year	0,5€/MWh
Band C	Offtake > 1 GWh/year and manufacturing industry with electricity cost > 4% of turnover	0,25 €/MWh

For the four profiles under review, we present a range of two possibilities: either the consumer can benefit from the Band C-rate for its offtake above 1 GWh (bottom of range) or he cannot in case of which the Band B-rate applies (top of range) on the offtake above 1 GWh.

3. *Offshore liability overload,* which is a levy to pay for offshore wind power generation units. Different rates apply to different bands of total electricity offtake in a similar fashion than what applies for the CHP surcharge.

Category	Consumer group	Rates		
Category A	All consumers that do not belong to category B	4,16 €/MWh		
Category B	 If consumption > 1 GWh / year and electricity cost is : For an extensive list of industrial sectors (annex 3 of EEAG)⁶³: >17% of gross added value⁶⁴ For a less extensive list of industrial sectors (annex 5 of EEAG) : >20% of gross added value 	 0,624 €/MWh (85% reduction), but capped⁶⁵ at 0,5% of gross added value (average last 3 years) for all consumers with electricity cost >20% of gross added value 4,0% of gross added values (average last 3years) for all consumers with electricity cost <20% of gross added value 		
Category C	 If consumption > 1 GWh / year and electricity cost is : For an extensive list of industrial sectors (annex 3 of EEAG)⁶⁶: between 14 and 17% of gross added value (avg. last 3 years) 	 0,832 €/MWh (80% reduction), but capped⁶⁷ at 0,5% of gross added value (average last 3 years) for all consumers with electricity cost >20% of gross added value 4,0% of gross added values (average last 3 years) for all consumers with electricity cost <20% of gross added value 		

The consumers that benefit from the bottom rate of the EEG (see further) also have bottom rate of 0,3 €/MWh for the Offshore liability overload.

For the four consumer profiles under review, we present a range from the bottom rate to the category C rate.

 $^{^{6}_3}$ Environmental and Energy State Aide Guidelines, Communication C200/50 of the European Commission.

⁶⁴ The notion of gross added value is defined in Annex 4 of the Environmental and Energy State Aide Guidelines, Communication C200/50 of the European Commission.

⁶⁵ However, these caps are only applicable if the consumer is part of an energy efficiency system improvement program.

⁶⁶ Environmental and Energy State Aide Guidelines, Communication C200/50 of the European Commission.

⁶⁷ However, these caps are only applicable if the consumer is part of an energy efficiency system improvement program.



4. The *"EEG-Umlage"* contributes to the financing of all renewable energies other than offshore wind power generation units. Consumers are divided in 2 different categories: those belonging to category A pay one single 'top rate' on their entire consumption, while consumers belonging to category B only pay this top rate for the 1st GWh of electricity consumption. For any consumption exceeding 1 GWh/year, category B consumers benefit at least from an 85% reduction on the EEG-Umlage⁶⁸ and category C consumers at least from an 80% reduction on the EEG-Umlage. The system can be summarized as follows:

Category	Consumer group	Rates
Category A	All consumers that do not belong to category B	64,05 €/MWh
Category B	 If consumption > 1 GWh / year and electricity cost is : For an extensive list of industrial sectors (annex 3 of EEAG)⁶⁹: >17% of gross added value⁷⁰ For a less extensive list of industrial sectors (annex 5 of EEAG) : >20% of gross added value 	 9,61 €/MWh (85% reduction), but capped⁷¹ at 0,5% of gross added value (average last 3 years) for all consumers with electricity cost >20% of gross added value 4,0% of gross added values (average last 3 years) for all consumers with electricity cost <20% of gross added value
Category C	 If consumption > 1 GWh / year and electricity cost is : For an extensive list of industrial sectors (annex 3 of EEAG)⁷²: between 14 and 17% of gross added value (avg. last 3 years) 	 12,81€/MWh (80% reduction), but capped⁷³ at 0,5% of gross added value (average last 3 years) for all consumers with electricity cost >20% of gross added value 4,0% of gross added values (average last 3 years) for all consumers with electricity cost <20% of gross added value

However, for category B and C consumers, a bottom rate of $0,5 \in /MWh$ applies for three specific industrial sectors (aluminium, zinc, lead and copper production), and of $1,0 \in /MWh$ for all other industrial sectors.

The EEG-Umlage is partially due on the consumption of self-generated electricity, depending on the nature and the quantity of self-generated electricity (*Eigenversorgung*). As we do throughout the entire report, we assume here as well that the four profiles under review do not produce any electricity themselves and are hence not concerned by the regulations regarding EEG-Umlage on self-generated electricity.

In this study, we present a range of possibilities given the fact that it is not possible to determine whether the four consumer profiles meet the economic criteria to qualify as a category B or C consumer. Category A – paying the full amount of 64,05 C/MWh – will be presented as an outlier, but constitutes the

⁶⁸ Reductions such as the EEG-Umlage that are destined to fund renewable energy are allowed according to the Environmental and Energy State Aid Guidelines or so-called EEAG framework.

 ⁹ Environmental and Energy State Aide Guidelines, Communication C200/50 of the European Commission.
 ⁹ The notion of gross added value is defined in Append 4 of the Environmental and Energy State Aide

^o The notion of gross added value is defined in Annex 4 of the Environmental and Energy State Aide Guidelines, Communication C200/50 of the European Commission.

⁷¹ However, these caps are only applicable if the consumer is part of an energy efficiency system improvement program.

⁷² Environmental and Energy State Aide Guidelines, Communication C200/50 of the European Commission.

⁷³ However, these caps are only applicable if the consumer is part of an energy efficiency system improvement program.



reality for an important group of non-electro-intensive consumers. In 2017, only 2.092 companies (representing 2.753 offtake points) of the over 45.000 industrial companies in Germany qualified for the criteria in category B. These 2.092 companies, however, represent about 48% of total German industrial energy consumption⁷⁴.

5. The "Stromsteuer" is an electricity tax. Since 2003, the normal tax rate equals 20,5 €/MWh. All industrial consumers that apply for it, benefit from a rate of 15,37 €/MWh, which is a reduction of the full rate with 25%. Further reductions on the rate for industrial consumers are attributed based on the amount of pension contributions a company pays: the fewer pension contributions a company pays, the higher the amount of the reduction on the Stromsteuer. The maximum reduction is 90%, which results in a reduced rate of 1,537 €/MWh. Since 2015, the application of this reduction (*Spitzenausgleich*) depends on the reaching of countrywide energy efficiency goals.⁷⁵ In 2017, 9.381 companies benefited from some kind of reduction through this system.⁷⁶

Aside from these reductions, electricity used as a raw material for electro intensive industrial processes is totally exempt from the electricity tax.

Hence, for all profiles, we will present a range from 0 (exempted) to 15,37 €/MWh. The lowest tariff for non-exempted users - 1,537 €/MWh - is included in this range.

6. The "Konzessionsabgabe" or concession fee is an energy tax that is imposed on all users to fund local governments. The basic rate for industrial users is 1,1 €/MWh. One exemption exists: consumers whose final electricity price (all taxes and grid fees included) remains under an annually fixed threshold (*in 2017: 125* €/MWh, published in November 2018)⁷⁷ are exempted from the concession fee.

In practice, for the profiles under review, this means that the concession fee is only due when no substantial reductions are applicable for the EEG-Umlage. We will hence only apply the concession fee in the (outlier) case where the full rate (64,05 €/MWh) of the EEG-Umlage is due.

7. The "*AblaV* §18 Umlage" is a levy to finance interruptible load agreements. In the year 2016, it was fixed at 0 €/MWh, while in 2017 it was reintroduced into the electricity bill at a value of 0,06 €/MWh. In 2018, it amounted to 0,11 €/MWh and in 2019 to 0,05 €/MWh.

4.3 France

Component 1 - the commodity price

In France, consumers are entitled to a certain amount of electricity at regulated rates ("Accès Régulé à l'Electricité Nucléaire Historique" (ARENH)), depending on their consumer profile. Commodity prices for industrial consumers are theoretically composed of a part of this ARENH-electricity at regulated rates on the one hand, and electricity based on market prices on the other hand. In this study, we assume that our consumers being rational can choose between:

- 1. A combination of the market price and the regulated price (ARENH),
- 2. Market prices only.

⁷⁴ Bundesamtes für Wirtschaft und Ausfuhrko-trolle (BAFA), Statistischen Auswertungen zur "Besonderes Ausgleichsregelung"; and BDEW Strompreisanalyse Januar 2018 – Haushalte und Industrie, Bundesverband der Energie- und Wasserwirtschaft e.V., Berlin.

⁷⁵ Stromsteuergesetz, §10.

⁷⁶ Bericht der Bundesregierung über die Entwicklung der Finanzhilfen des Bundes und der Steuervergünstigungen für die Jahre 2015 bis 2018, pg. 98.

⁷⁷ The Grenzpreis is fixed by the German statistics office and represents the average final electricity price of all industrial consumers.



The commodity formula to calculate the market price is applied to all profiles. For profiles E1 and E2, we use all hours except weekends of Epex Spot FR DAM, whilst for profiles E3 and E4 we use all hours of Epex Spot FR DAM. The formula was provided by the CREG and based on an analysis by the Belgian regulator of the electricity supply contracts of all Belgian consumers with an annual consumption above 10 GWh dating back to 2014.

In a similar fashion to the 2017 update, the sum of market prices and capacity certificates for 2019 (see "Component 3 – All extra costs") were higher than regulated prices (ARENH is set at 42 C/MWh). Consequently, the French regulator announced that 100 TWh of nuclear power at regulated prices will be reserved for consumers in 2019 due to the higher market prices. The quantity of nuclear power at regulated prices (ARENH) attributed to a supplier depends on its consumer portfolio and the consumption of that portfolio during a 'reference period'. Since 2015, this reference period consists of off-peak hours (1am to 7am) as well as all hours of Saturdays, Sundays and bank holidays from April to October, except for July and August, when peak-hours are taken into account as well⁷⁸. Given the consumption of profiles E1 and E2 is taken into account to allocate nuclear power at regulated prices to its supplier, 87,8% for E3 and 91,3% for E4. In 2019, commodity prices are thus a combination of the market price (including capacity certificates) and the regulated price.

In order to ensure comparative results and after stakeholder consultation, it was decided in agreement with the CREG to maintain this formula – also for possible future updates of this price comparison.

We summarize the commodity price formulas used for the different consumers below:

Commodity price E1 and E2

 $= 57,1\% ARENH + 42,9\% (47,1\% CAL Y_{-1} + 20,1\% CAL Y_{-2} + 7,1\% CAL Y_{-3} + 7,8\% Qi_{-1} + 2,2\% Mi_{-1} + 15,7\% EPEX Spot FR)$

Commodity price E3

= 87,8% ARENH + 12,2% (47,1% CAL Y_{-1} + 20,1% CAL Y_{-2} + 7,1% CAL Y_{-3} + 7,8% Qi_{-1} + 2,2% Mi_{-1} + 15,7% EPEX Spot FR)

Commodity price E4

= 91,3% ARENH + 8,7% (47,1% CAL Y_{-1} + 20,1% CAL Y_{-2} + 7,1% CAL Y_{-3} + 7,8% Qi_{-1} + 2,2% Mi_{-1} + 15,7% EPEX Spot FR)

where:

	Explanation
ARENH	Nuclear power at regulated price of 42€/MWh
CAL Y ₋₁	Average year ahead forward price in 2018
CAL Y ₋₂	Average two year ahead forward price in 2017
CAL Y ₋₃	Average three year ahead forward price in 2016
Qi ₋₁	Average quarter ahead forward price in the fourth quarter of
	2018
Mi ₋₁	Average month ahead forward price in December 2018

⁷⁸ Arrêté du 17 mai 2011 relatif au calcul des droits à l'accès régulé à l'électricité nucléaire historique, article 2.

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Component 2 – network costs

Integrated transmission and distribution costs

In France, the transmission System Operator (TSO) in charge of the transport network is "RTE" ("Réseau de Transport d'Electricité"). The French high voltage network starts at 1 kV as shown in the table below.

Connection voltage (U _n)	Tariff scheme		Grid	
U _n ≤ 1 kV	BT		Low voltage (DSO)	
$1 \text{ kV} < U_n \leq 40 \text{ kV}$	HTA1	НТА		
40 kV < U _n ≤ 50 kV	HTA2	Profile	Uigh voltage (TSO)	
50 kV < U _n ≤ 130 kV	HTB1		High voltage (TSO)	
130 kV < U _n ≤ 350 kV	HTB2	HTB Profile		
350 kV < U _n ≤ 500 kV	HTB3		Extra high voltage (TSO)	

We assume that profile E1 pays the HTA1 tariff (1-40kV). As the HTA2-tariff is identical to the HTB1-tariff, we assume profile E2 pays the HTB1-tariff (40-130 kV). We assume profiles E3 and E4 pay the HTB2-tariff.

Transmission tariffs in France involve four components detailed below:

- 1. Management cost;
- 2. *Metering cost*;
- 3. Withdrawal tariff:

For HTA2/HTB1 and HTB2 tariffs, this tariff includes a fee for reserved load capacity (which is a single fee), a fee for load capacity weighted according to 5 time slots and a fee for the offtake which is a variable fee based on the consumption in 5 time slots. This tariff offers three contract options with different rates: short, medium or long utilization. It is assumed that the load capacity is constant throughout the year. We assume our profiles pick the most advantageous contract option: medium for E2, and long for E3 and E4.

For HTA1 tariffs, the tariff works in a similar way offering four contract options (a short utilisation with fixed peak, a long utilisation with fixed peak, a short utilisation with mobile peak, and a long utilisation with mobile peak) this time based on the offtake in 5 different time slots⁷⁹. We assume our profile E1 takes the most advantageous contract option: a long utilisation tariff with fixed peak.

- 4. *Other fees* such as a fee for planned and unplanned exceeding of power capacity, a fee for regrouping of connection, a complementary fee and emergency power supplies, a fee for reactive energy and a transformation fee. Those fees are not taken into account for the profiles under review.
- 5. *Injection fees* which need to be paid for the injection in the grid. Injection fees are not taken into consideration for the profiles under review.

Since February 2016, a new and relatively complex transmission tariff reduction was introduced to replace the more straightforward transmission tariff reductions that

⁷⁹ This tariff structure is of application since August 1st 2018 under TURPE 5 legislation.



were in place between mid-2014 and late 2015⁸⁰. Those reductions are financed by an increase in transmission tariffs billed to the network users who are not eligible for those reductions.

Reductions are granted to baseload, 'anti-cyclical' and very large consumers according to the principles laid out in the table below:

⁸⁰ Décret n° 2016-141 du 11 février 2016 relatif au statut d'électro-intensif et à la réduction de tarif d'utilisation du réseau public de transport accordée aux sites fortement consommateurs d'électricité.

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ORIGIN OF ELIGIBILITY		REDUCTION PERCENTAGE GRANTED				
Stable profiles	Anti-cyclical profiles	Large consumers	Hyper electro- intensive cons. sites (art. D. 351- 3)	Electro- intensive cons. sites (art. D. 351- 2 or art D. 351-1)	Power storage sites connected to the grid	Other sites
annual offtake >10 GWh and ≥7000 hours	annual offtake >20 GWh and off peak grid utilisation ≥44%	annual offtake >500 GWh and off peak grid utilisation ≥40% and ≤44%	80 %	45 %	30 %	5 %
annual offtake >10 GWh and ≥7500 hours	annual offtake >20 GWh and off peak grid utilisation ≥48%		85%	50 %	40 %	10 %
annual offtake >10 GWh and ≥8000 hours	annual offtake >20 GWh and off peak grid utilisation ≥53%		90 %	60 %	50 %	20 %



Electro-intensive and hyper-electro-intensive consumers are defined as follows:

	Power consumed/Value added	Trade-intensity	Annual power consumption
Electro- intensive	>2,5 kWh/€	>4%	>50 GWh
Hyper-electro- intensive			Not applicable

Given this framework, we can make the following assumptions for the four consumer profiles under review:

- Profile E1 is not eligible for any reduction, as it does not meet the criteria for stable, anti-cyclical or large consumer.
- Profile E2 is not eligible for any reduction, as it does not meet the criteria for stable, anti-cyclical or large consumer with an off-peak utilisation rate of 41%.
- Profile E3 is eligible for a reduction, as a stable consumer profile. With 7.692 consumption hours per year, depending on the industrial activity and hence the electro-intensity of the consumer, the reduction can vary from 10% to 85%.
- Profile E4 is eligible for a reduction, as a stable consumer profile. With 8.000 consumption hours per year, depending on the industrial activity and hence the electro-intensity of the consumer, the reduction can vary from 20% to 90%.

Component 3 - all extra costs

In France, two different surcharges apply to electricity. Also, since 2017, users have to pay for capacity certificates covering their demand. The surcharges are detailed as follows:

1. The *"Contribution tarifaire d'acheminement"* (CTA) is a surcharge for energy sector pensions.

For consumers directly connected to the transmission grid or who are connected to the distribution grid on or above 50 kV (profiles E2, E3 and E4 in France), the CTA amounts to 10,14% of the fixed part of the transmission tariff. For all other consumers connected to the distribution grid, the CTA amounts to 27,04% of the fixed part of the transmission tariff (profile E1 in France).

2. The "Contribution au service public d'électricité" (CSPE)⁸¹⁸² is a surcharge which feeds a special budgetary program "Public service of energy" that pays (amongst other things) for the cost of support for the production of electricity from gas-fired cogeneration plants, the *péréquation tarifaire* (including a small part of cost of renewables) and social tariffs.

From 2016 to 2019, the CSPE is 22,5 €/MWh. Three reductions are applicable:

a. For electro-intensive consumers where the CSPE would have been (without reductions and exemptions) at least equal to 0,5% of added value, the CSPE is equal to:

⁸¹ In 2015, the "Contribution au service public d'électricité" (CSPE) and « Taxe intérieure sur la consommation finale" merged, and were renamed CSPE.

⁸² Code des douanes, article 266 quinquies C.

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- i. 2 €/MWh for consumers consuming above 3 kWh per euro of added value;
- ii. 5 €/MWh for consumers consuming between 1,5 and 3 kWh per euro of added value;
- iii. 7,5 €/MWh for consumers consuming below 1,5 kWh per euro of added value.
- b. For <u>hyper-</u>electro-intensive consumers, the tariff amounts to 0,5 €/MWh. To be very electro-intensive, consumers must satisfy both conditions:
 - i. their energy consumption represents more than 6 kWh per euro of added value;
 - ii. their activity belongs to a sector with a high trade intensity with third countries (> 25%).
- c. Sectors with a high risk of carbon leakage are metallurgy, electrolysis, non-metal minerals or chemical sectors. For electro-intensive consumers described under (i) above with a high risk of carbon leakage linked to indirect carbon emissions, the CSPE amounts to:
 - i. 1 €/MWh for consumers consuming above 3 kWh per euro of added value;
 - ii. 2,5 €/MWh for consumers consuming between 1,5 and 3 kWh per euro of added value;
 - iii. 5,5 €/MWh for consumers consuming below 1,5 kWh per euro of added value.

Lacking more detailed economic and financial data on the consumer profiles, we cannot exclude that the maximum rate of 22,5 C/MWh applies to one or more of our consumer profiles. More specifically, the economic conditions needed for the maximum rate to be applicable are the following (**cumulative**):

1. The annual added value of the industrial company exceeds:

45 MEUR
112,5 MEUR
450 MEUR
2.250 MEUR

- 2. The industrial company does not meet the criteria for very-electrointensity specified under (ii).
- 3. The industrial company does not meet the criteria for carbon leakage risk defined under (iii).

We will therefore present the maximum rate of 22,5 €/euros per MWh as a possible outlier for all consumer profiles (non-electro-intensive consumers). Moreover, we will present a range from 0,5 €/euros per MWh to 7,5 €/euros per MWh for electro-intensive consumers.

3. Since 2017, every supplier needs to hold capacity certificates to cover for the demand of its users during peak times. Final customers also need to hold capacity certificates to cover their demand during peak times. The final demand to be covered is subject to a reduction factor, which was 0,99 in 2019.



The price per certificate is of 17.365 C/MW in 2019^{83} . Electricity bought at regulated prices contains capacity certificates, and hence capacity certificates only need to be bought for the electricity which is not bought at regulated rates. For the profiles under study, the assumption is made that their electricity usage during peak moments is the same as during other moments.

4.4 The Netherlands

Component 1 - the commodity price

The commodity prices for the Netherlands are calculated based on market prices. The national indexes used in the calculation of the commodity price is the ICE Endex CAL and the APX NL DAM.

The commodity formula is applied to all profiles. For profiles E1 and E2, we use all hours except weekends of APX NL DAM, whilst for profiles E3 and E4 we use all hours of APX NL DAM.

The formulas used for pricing commodities in this study was provided by the CREG and are based on an analysis by the Belgian regulator of the electricity supply contracts of all consumers with an annual consumption above 10 GWh, dating back to 2014. In order to ensure comparative results and after stakeholder consultation, it was decided in agreement with the CREG to maintain this.

Commodity price

```
= 47,1\% \ CAL \ Y_{-1} + 20,1\% \ CAL \ Y_{-2} + 7,1\% \ CAL \ Y_{-3} + 7,8\% \ Qi_{-1} \ + \ 2,2\% \ Mi_{-1} \ + \ 15,7\% \ APX \ NL \ DAM
```

where:

	Explanation
CAL Y ₋₁	Average year ahead forward price in 2018
CAL Y ₋₂	Average two year ahead forward price in 2017
CAL Y ₋₃	Average three year ahead forward price in 2016
Qi ₋₁	Average quarter ahead forward price in the fourth quarter of
-	2018
Mi_1	Average month ahead forward price in December 2018

Component 2 – network costs

In the Netherlands, the network costs involve two components⁸⁴:

- 1. Standing charge, metering charge and periodical connection tariff;
- 2. Transport service tariff (capacity tariff).

The Dutch transmission grid, operated by the TSO TenneT, encompasses all electricity transport infrastructures above 110 kV. Profiles E3 and E4 are hence assumed to be directly connected to the transmission grid, to the high voltage (110-150 kV) and to the extra high voltage grid (220-380 kV) respectively.

Profiles E1 and E2, on the other hand, are assumed to be connected to the distribution grid. As it is the case in Germany, the distribution and transmission tariffs are integrated. As we previously explained, we will present a weighted average of the seven distribution zones.

⁸³ In the 2017 update published on 29 March 2017, no capacity certificates were taken into consideration for 2017. This is rectified in this version, which explains the small difference in results for 2017 in this version and the 2017 update.

⁸⁴ As of January 1st 2015, system service tariffs have been abolished.

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Since January 1st 2014, a substantial reduction⁸⁵ ("volumecorrectie") on transport tariffs is granted to large base-load consumers on the basis of two simultaneous conditions:

- 1. The customer exceeds 50 GWh/year in terms of offtake;
- The consumer consumes at least during 65% of all the 2.920 off-peak hours per year⁸⁶.

These two conditions must be jointly fulfilled. If so, the maximum reduction is limited to 90%, which is the case for profile E4 in this study. Profile E3 benefits from this measure as well with a reduction of 45%. The formula for which the reduction has been calculated is the following:

 $\frac{(bedrijfstijd - 65\%)}{(85\% - 65\%)} * \frac{(offtake - 50 \, GWh)}{(250 \, GWh - 50 \, GWh)} * 100$

Where bedrijfstijd (in %) =

(total offtake in off – peak hours) maximum capacity * 100 hours per annum

Those reductions are financed by an increase in transmission tariffs billed to the network users who are not eligible for those reductions.

Component 3 – all extra costs

In general, two surcharges apply to the electricity bill for industrial consumers:

The *Energy Tax* is a digressive tax on all energy carriers. The energy tax for electricity in 2019 has the following rates:

Band	Consumption level	Rates
Band A	Consumption up to 10 MWh	98,63 €/MWh
Band B	Consumption from 10-50 MWh	53,37 €/MWh
Band C	Consumption from 50-10.000 MWh	14,21 €/MWh
Band D	Consumption above 10.000 MWh (professional)	0,58 €/MWh

2. The *ODE levy* is a digressive levy, except for the first 10 MWh, on gas and electricity that pays for renewable capacity. The rates for 2019 are the following:

 $^{^{8}_5}\,$ For a more detailed explanation of the reduction, see Elektriciteits wet 1998, Artikel 29, 7e - 10de lid.

⁸⁶ The off-peak hours are those between 11pm and 7am and all of those in the weekends and national holidays.



Band	Consumption level	Rates
Band A	Consumption up to 10 MWh (with tax reduction)	18,9 €/MWh
Band B	Consumption from 10-50 MWh (with tax reduction)	27,8 €/MWh
Band C	Consumption from 50-10.000 MWh	7,4 €/MWh
Band D	Consumption above 10.000 MWh (professional)	o,3 €/MWh

There are several exceptions on these tax surcharges. First of all, some consumers can apply for a tax refund scheme ('teruggaafregeling'). This refund is destined for industrial consumers which are classified as being energy-intensive⁸⁷ and which concluded a multiple-year agreement with the Dutch government to save energy by improving their energy efficiency. These consumers can apply for a refund of any tax paid above their consumption of 10.000 MWh after each financial year. The refund is equal to the part that has been charged above the European minimum tax level per MWh ($o, 5 \in /MWh$).

Next to this refund scheme, taxes are completely exempted for those industrials whose electricity is produced with renewable energy sources, with an emergency installation during power breakdowns and with combined heat and power (CHP) installations. Tax exemption is also granted to those industrials that use their electricity for chemical reduction, electrolytic and metallurgic processes⁸⁸. Tax discounts are also possible for cooperatives. However, the profiles under study are typically no cooperatives, so this is not taken into consideration.

Given the fact that several of the criteria that give access to these tax refunds are based upon economic and accounting data, we will present a range of results with an outlier option (maximum rate only applicable if the industrial consumer is not energy intensive⁸⁹ and cannot qualify for the full exemption), and a range spanning from the minimal option (totally exempted) to the refund rate (0,5 C/MWh).

4.5 United Kingdom

Component 1 - the commodity price

Commodity prices in the United Kingdom are based on market prices. The national index used in the calculation of commodity price is the APX UK DAM. The commodity price formulas used for pricing commodities in this study were provided by the CREG and are based on an analysis by the Belgian regulator of the electricity supply contracts of all consumers with an annual consumption above 10 GWh, dating back to 2014. In order to ensure comparative results and after stakeholder consultation, it was decided in agreement with the CREG to maintain this formula.

As no "Calendar +1/2/3" product exists for the UK power market, it was replaced by the aggregation of seasonal products on the ICE futures market. BBS_x quotes the

⁸⁷ An energy-intensive company is a company for which the costs of energy or electricity is more than 3% of the total value of production or the energy taxes and tax on mineral oils is at least 0,5% of the added value (Wet Belastingen op Milieugrondslag, Artikel 47, 1p).

⁸⁸ A more detailed version of the rules regarding the exemptions and refund schemes can be found in Wet Belastingen op Milieugrondslag, Artikel 64 and 66.

⁸⁹ See footnote 53



baseload electricity price on the ICE index for x seasons⁹⁰ ahead. Therefore, we have used twelve months of BBS2 (two seasons ahead) to replace CAL Y-1⁹¹, twelve months of BBS4 (four seasons ahead) to replace CAL Y-2 and twelve months of BBS6 (six seasons ahead) to replace CAL Y-3.

The commodity formula is applied to all profiles. For profiles E1 and E2, we use all hours except weekends of APX UK DAM, whilst for profiles E3 and E4 we use all hours of APX UK DAM.

Commodity price

```
= 47,1\% \ CAL \ Y_{-1} + 20,1\% \ CAL \ Y_{-2} + 7,1\% \ CAL \ Y_{-3} + 7,8\% \ Qi_{-1} \ + \ 2,2\% \ Mi_{-1} \ + \ 15,7\% \ APX \ UK \ DAM
```

where:

	Explanation
CAL Y_{-1}	Average year ahead forward price in 2018
CAL Y ₋₂	Average two year ahead forward price in 2017
CAL Y ₋₃	Average three year ahead forward price in 2016
Qi ₋₁	Average quarter ahead forward price in the fourth quarter of
	2018
Mi ₋₁	Average month ahead forward price in December 2018

We calculated the commodity cost (based on the formula above) entirely in Pound Sterling, and converted the final result to Euro at the January 2019 exchange rate (see also section 3.1).

Component 2 - the network costs

Transmission costs

The network structure in the United Kingdom has been described above on geographical level with three TSOs, six DSOs and fourteen tariff zones identified. On a technical level, the grid is organized as follows:

Connection voltage (U _n)	Operator	Tariff scheme
U _n < 22 kV	DSO	Common distribution charging methodology (CDCM) + Transmission charges (TNUoS)
$\mathbf{22kV} \leq \mathbf{U_n} \leq 132 \; \mathbf{kV}$	030	Extra high voltage distribution charging methodology (EDCM) + TNUoS
$275 \text{ kV} \le U_n \le 400 \text{ kV}$	TSO	Transmission charges (TNUoS)

As in the German case, given the particularly high voltage level of the transmission grid, we assume profiles E1 and E2 are both connected to the distribution grid and pay both distribution and transmission charges. Profiles E3 and E4 are assumed to be directly connected to the transmission grid and only pays transmission charges.

Transmission Network Use of System (TNUoS) charges in the UK have two different rates: half-hourly (HH) metered customers pay a capacity tariff in

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⁹⁰ A season corresponds to a six-month period, either the summer (April – September) or the winter (October – March).

⁹¹ For instance, to estimate CAL Y-1 price for January 2019, we have taken the average price quotation over the course of 12 months (from October 2017 to September 2018) of the 'two seasons ahead' seasonal forward. This can be equated to the year-ahead price quotations present in the other countries under review, with the difference that the UK year within which the electricity is consumed lasts from October 2017 to September 2018 while for the other countries it runs from January 2018 to December 2018



function of their power subscription, while customers who are not half-hourly metered pay a demand rate in function of their electricity offtake. We assume profiles E1, E2, E3 and E4 are half hourly metered and hence pay the capacity rate. This HH tariff is zonal: there is a different rate for all fourteen zones of the UK. We present an average value of these fourteen zonal tariffs as transmission cost for profiles E1, E2, E3 and E4.

With regards to *network losses* on the transmission grid, a similar (but more dynamic) system to the one applicable in Belgium exists. Each half hour, the Balancing and Settlement Code Administrator defines the Transmission losses multiplier (TLM) applicable for offtake and delivery. This cost of the network losses on the transmission grid is added to the bill as a percentage of the commodity cost for offtake, but we consider it to be part of component 2, as it is a true network cost – even though it is not part of the tariff structure as such.

Distribution costs

Distribution costs, which are due for profiles E1 and E2, have a more complex methodology. Profile E1 pays the Common Distribution Charging Methodology (CDCM) and is billed for total offtake across all demand time periods, with important differences between peak and off-peak offtake. Profile E2 is charged differently, through the EHV Distribution Charging Methodology (EDCM). EDCM charges are largely based on capacity with a small element for offtake in the high demand time period. The EDCM provides for individual tariffs for each customer depending upon location, demand, generation (type) and capacity. As the individual EDCM-rates are made public on an anonymous basis, we have calculated the average discount of individualized EDCM-rates compared to CDCM-tariffs in each of the fourteen zones. We present the average discount of EDCM-rates on CDCM-tariffs in the fourteen zones as the distribution cost value for profile E2.

Component 3 - all extra costs

Three different extra costs are taken into consideration for the UK: two levies and the indirect cost of one renewable subsidies scheme.

- 1. The *Climate Change Levy* (CCL)⁹² is a levy payable on electricity, gas and solid fuels (such as coal, lignite, coke and petroleum coke). Its basic rate for electricity offtake is 6,58 €/MWh (0,583p/kWh), but energy intensive consumers that have entered a Climate Change Agreement (CCA) with the Environment Agency can benefit from a 90% reduction. Given the assumption of this study that the customer profiles under review are economically rational and given the large scope and rate of application of CCA's, we assume profiles E1, E2, E3 and E4 are all part of Climate Change Agreement.
- 2. The Assistance for Areas with High electricity distribution Costs (AAHEDC)⁹³ levy is a simple rate general levy to compensate for high distribution costs in the zone of Northern Scotland (1 of the 14 zones) corresponding to 0,277 €/MWh (0,024527 p/kWh).
- 3. The **Renewables Obligation (RO)**⁹⁴ is the cost taken into account for the large scale renewable subsidy scheme. From April 2018 to April 2019, the

https://www.gov.uk/government/publications/rates-and-allowances-climate-changelevy/climate-change-levy-rates

³ https://www.nationalgrideso.com/document/119391/download

https://www.ofgem.gov.uk/publications-and-updates/renewables-obligation-ro-buy-out-priceand-mutualisation-ceilings-2017-18
 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/560421/RO_se tting_2017-18_explanatory_note__1_October_2016_-_typos_corrected.pdf



renewable quota is 0,468 Renewable Obligation Certificates (ROC's) per MWh. Given the fee per missing ROC of 53,294€ (47,22 £/MWh), the penalty for non-ROC-covered electricity is 24,942 €/MWh (22,099 £/MWh). As we did in the Belgian case, we will take the average price of one ROC between 1st of February 2018 and 31st of January 2019 to take this cost into account.

4. An additional cost identified in the United Kingdom is that of the **capacity market**. However, this cost could not be specified because it is paid for by the suppliers, who integrate it in their offerings and do not disclose the exact amount of the costs to their consumers. Therefore, and because the United Kingdom is an outlier for each of the electricity profiles under review, it was decided to not take this cost into consideration. The reported prices in this study can therefore be seen as a slight underestimation of the real electricity cost in the United Kingdom.

5. Gas: Detailed *description of the prices, price components*



5. Gas: Detailed description of the prices, price components and assumptions

5.1 Belgium

Component 1 - the commodity price

Commodity prices for natural gas in this study are based on market prices.

For both profiles G1 and G2, the commodity price reflected in this study is the average of all monthly prices observed during the previous calendar year at the Zeebrugge Trading Point (ZTP) managed by Fluxys Belgium. Yet, the majority of Belgian industrial consumers' contracts are indexed on TTF⁹⁵, which now represents the largest component in most cases.

This average tackles the non-intuitive results obtained with the previous methodology, as commodity prices can differ strongly from one month to another, and mitigates large differences of commodity prices between countries due to specific situations within a certain period of the year.

All commodity data were provided by the CREG.

Component 2 - network costs

Transmission costs

As discussed in the consumer profiles, we assume that profile G2 is directly connected to the transport grid, whilst profile G1 is connected to the distribution grid (T6).

About 230 industrial clients in Belgium are directly connected to the grid of TSO Fluxys Belgium⁹⁶. We assume consumer G2 is connected at the high-pressure level (which is the case for the vast majority of industrial consumers).

In Belgium, the transmission costs for a direct client have three main components:

- 1. *Entry capacity fee* (border point entry fee);
- Exit capacity fee (HP capacity fee or "fix/flex" option and MP capacity fee) 97;
- 3. Commodity fee ("energy in cash").

Optional tariffs for odorization exist, but are not taken into account in the scope of this study, given the fact that the vast majority of industrial consumers in Belgium on the TSO-grid does not need odorization services from Fluxys.

⁹⁵ Dutch's natural gas trading hub

⁹⁶ It has to be noted that no such client exists in the Brussels Capital Region.

⁹⁷ For HP capacity at end-user domestic exit points, the "fix/flex" tariff option can be chosen. Furthermore, 99% of the Belgian industrial consumers need to pay HP capacity fees, while the MP capacity fee is due for 38% of the Belgian industrial consumers. The exit capacity was therefore calculated as follows: 0,99* HP-tariff + 0,38*MP-tariff



Part of the network in Belgium is supplied with "L-gas". This gas has a lower calorific value than the "H-gas" that is used in most of Western Europe. About 10% of industrial consumers directly connected to the gas transport grid in Belgium use L-gas⁹⁸.

	Label	Capacity tariff (€/kWh/h/ year)	Direct exit points (excluding power plants)	€/MWh allocated at the domestic exit point (for the "Fix/Flex" option)
HP	H-grid	1,088	90%	
capacity	L-grid	1,255	10%	
"Fix/ flex"	H-grid	0,545	90%	$h \le 2.000: 0,268 €/MWh$
option	L-grid	0,628	10%	h>2.000: 0,016 €/MWh
МР	H-grid	0,603	90%	
capacity	L-grid	0,696	10%	

Belgian gas transport tariffs are largely capacity based and expressed in $\mathbb{C}/kWh/h/year$. This means that profile G2 has a higher transport cost in parts of the country with a lower calorific value of the gas (L-gas). In the scope of this study, we therefore propose a weighted average of H and L-tariffs as value for the transport cost for profile G2⁹⁹.

For HP capacity at end-user domestic exit points, a "fix/flex" tariff option can be chosen instead of the HP capacity tariff. The variable term (Flex term) depends on a number of hours "h", which is calculated as the division of the allocated energy at the domestic exit point by the subscribed capacity at that point. We assume our profiles opt for the most advantageous contract option i.e. the standard HP capacity tariff¹⁰⁰. For some industrial consumers a MP capacity fee has to be included to the transport costs as well¹⁰¹.

Finally, the commodity fee depends on the annual consumption of the end user (in MWh/year). It accounts to 0,08% of a theoretical commodity cost per year, based on the Gas Price Reference¹⁰², which is the ZTP average of day-ahead commodity prices, as published by Powernext.

Distribution costs

As previously stated, profile G1 is connected to the distribution grid. Industrial consumers connected to the distribution grid need to pay an additional distribution tariff next to the transmission cost. In our study, we select the tariffs for the highest category on the distribution grid (i.e. T6)¹⁰³. For each Belgian region, gas distribution tariffs typically have three components:

- 1. Fixed component;
- 2. Proportional component;
- 3. Capacity component.

For each region in Belgium, we compute the tariff through a weighted average of each component across all DSOs active in the region (weights are given in terms of distributed gas per DSO in 2016). As previously stated, for the Flemish region, all

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⁹⁸ Calculation of PwC based on figures publicly available on the Fluxys website.

⁹⁹ At the time of the previous report, 20% of industrial consumers were paying more expensive L-tariffs, compared to 10% as of January 1st 2017 based on data provided by CREG.

¹⁰⁰ In 2016 the "Fix/flex"-option was still the most advantageous option.

 ¹⁰¹ We have used the weights of these connections in order to calculate the exit tariff fee, see footnote 97.
 ¹⁰² For more information on the Gas Price Reference, please see http://www.fluxys.com/belgium/en/Services/Transmission/TransmissionTariffs/TransmissionTariffs

¹⁰³ T5 (and not T6) is the highest category for Sibelga network active in Brussels which we use in the scope of this study.



DSOs operated by FLUVIUS were taken into account (representing 100% of distributed gas in the region in 2016). For the Walloon region, all DSOs operated by ORES and RESA were taken into account (also representing 100% of distributed gas in the region in 2016 given that GASELWEST's activities were transferred to ORES Mouscron).

Component 3 - all extra costs

In Belgium, two extra costs are charged to all gas consumers directly connected to the transport grid:

1. *Federal contribution* (0,6043 €/MWh), increased by 1,1% by the supplier, with digressive tariff reductions:

Consumption	Rates	
0-20 GWh	0%	
20-50 GWh	-15%	
50-250 GWh	-20%	
250-1.000 GWh -25%		
> 1.000 GWh -45%		
-> Ceiling of 750.000 €/year by consumption site		

- 2. Energy contribution, with three different tariffs.
 - The normal rate (top rate) of 0,9978 €/MWh.
 - Users that are part of an energy efficiency agreement in their region benefit from a reduced rate of 0,54 €/MWh.
 - Users that use natural gas as a raw material for their industrial process are exempted from the energy contribution (o €/MWh).

We assume profile G1, as a rational actor, has concluded an energy efficiency agreement. Therefore, the energy contribution for profile G1 is 0.54 €/MWh.

As we include the option that profile G2 is a feedstock consumer (using natural gas as a raw material during the industrial process), we present a range from 0 (totally exempted from the energy contribution) to $0.54 \in MWh$ (reduction when concluding an energy efficiency agreement).

Profile	Rates	
Normal rate (not applicable for profiles G1 and G2)	0,9978 €/MWh	
Companies with sectoral energy efficiency agreements	0,54 €/MWh	
Companies that use natural gas as a raw material	Totally exempted	

Aside from those extra costs, three other regional taxes exist:

3. The Brussels levy for occupying road network (1,248 €/MWh). For this fee, the regional legislator introduced a cap starting January 1st 2007 (no fee due on gas above 5.000.000 m³/year (=+/- 57,5 GWh)), but the decree to make it applicable has not been issued so far. As a consequence, this ceiling is not applied in Brussels¹⁰⁴;

¹⁰⁴ Source: Ordonnance du 14 décembre 2006 modifiant les ordonnances du 19 juillet 2001 et du 1er avril 2004 relatives à l'organisation du marché de l'électricité et du gaz en Région de Bruxelles-Capitale et abrogeant l'ordonnance du 11 juillet 1991 relative au droit à la fourniture minimale d'électricité et l'ordonnance du 11 mars 1999 établissant des mesures de prévention des coupures de gaz à usage domestique, article 102

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- 4. The *connection fee* in Wallonia (0,03 €/MWh) which is a tax on grid connection with digressive rates. The rate for large consumers (≥10 GWh/year) of 0,03 €/MWh applies both to profile G1 and G2.
- 5. Levy for occupying road network in Wallonia (0.1269 €/MWh).

For profile G1 connected to the distribution grid (at T6), local taxes and levies have to be added to federal taxes. These comprise:

- 6. *Additional taxes and levies* which are (i) expenses and unfunded pensions, (ii) income tax and (iii) other local, provincial, state and federal taxes, levies, charges, contributions and payments (only for profile G1);
- 7. The Brussels region public service obligation: 60,55 C/month (only for profile G1).

5.2 Germany

Component 1 - the commodity price

Commodity prices for natural gas in this study are based on market prices. As previously explained, in Germany two market indices exist: Gaspool and NetConnectGermany (NCG).

For both profiles G1 and G2, the commodity price for Germany reflected in this study is the average of all monthly prices observed during the previous calendar year for NCG and Gaspool.

This average tackles the non-intuitive results obtained with the previous methodology, as commodity prices can differ strongly from one month to another, and mitigates large differences of commodity prices between countries due to specific situations within a certain period of the year. All commodity data were provided by the CREG.

Component 2 – the network costs

Transmission costs

As explained in section 3.4, Germany has eleven TSOs with directly connected clients. They all apply a similar tariff methodology, with different rates. For profile G2 we have taken into account the entry and exit capacity tariffs for all TSOs with end-users directly connected to the transport grid as well as the costs related to metering and invoicing. Although every TSOs uses a slightly different terminology, transmission tariffs comprise in general the same three components:

- 1. *Entry point (i.e. "Einspeisung") capacity rate*: depends on the contracted entry point and the capacity contracted (in kW);
- 2. *Exit point (i.e. "Ausspeisung") capacity rate:* depends on the exit point chosen and the capacity contracted (in kW);
- 3. *Metering and metering point operation per counting point charges:* charges related to the cost of metering, fixed prices expressed in € per year.

Distribution costs

As profile G1 is connected to the distribution grid, the tariffs of 8 different DSOs (4 rural, 4 urban) are being considered. In Germany for those consumers connected to the distribution grid, transmission and distribution costs are integrated in one single tariff. Although every DSO uses different bands and different rates, these tariffs comprise the same three components:



- 1. *Power charge (i.e. "Leistungspreis")*: depends upon the maximum capacity in kW contracted;
- 2. *Labour charge (i.e. "Arbeitspreis")*: depends upon the volume of energy consumed in kWh per year;

Metering and metering point operation per counting point charges: charges related to the cost of metering and invoicing, fixed prices expressed in euro per year.

Component 3 - all extra costs

Four additional costs on natural gas exist for industrial consumers in Germany: the Biogas levy (i.e. *"Biogaskostenwälzung"*), the Market Area Conversion Levy (i.e "Marktraumumstellungsumlage"), the Gas tax (i.e. *"Energiesteuer – Erdgassteuer"*) and the Concession fee (i.e. *"Konzessionsabgabe"*):

- 1. The *Biogas Levy* is a nationwide standard biogas levy since January 1, 2014. This Biogas levy for 2019 amounts to approximately 0,6619 €/kWh/h/y.
- 2. The *Market Area Conversion Levy* is a charge that makes up for the costs of the conversion from L- to H-gas. The 2018 charge amounts to 0,3181 €/kWh/h/y.
- 3. The "*Energiesteuer*" (*gas tax*) is an energy tax, with different rates for different sources of energy. For natural gas for industrial use, the normal tax rate amounts to 5,50 €/MWh with a standard reduction that lowers the rate to 4,12 €/MWh. As it is the case for the electricity tax in Germany, further reductions are granted based on the amount of pension contributions a company pays: the fewer pension contributions a company pays, the higher the amount of the reduction on the "*Energiesteuer*" is. The maximum reduction is 90%, but this reduction does not apply to the reduced tax rate of 4,12 €/MWh, but to a lower figure of 2,28 €/MWh. A basic rate of 1,84 €/MWh (4,12-2,28) remains 'incompressible'. The minimum rate is hence 2,07 €/MWh (1,84 + 10%*2,28)¹⁰⁵¹⁰⁶.

For natural gas that is not used as fuel or for heating purposes (but rather as a raw material, feedstock in an industrial process), no energy tax (*"Energiesteuer"*) is due¹⁰⁷.

As the pension payment reduction system is based on economic criteria that are not detailed for profile G1 and based on the assumption that profile G1 uses gas as a raw material, we will present a range from 2,07 C/MWh (the minimum rate of the *"Energiesteuer"*) to 4,12 C/MWh (standard reduction of the *"Energiesteuer"*).

As we include the option that profile G2 is a feedstock consumer (that uses natural gas a raw material in its industrial process), we present a range from $0 \notin MWh$ (assuming it only has to pay the Biogas Levy and is exempted from the *"Energiesteuer"*) to 4,12 $\notin MWh$ (standard reduction of the *"Energiesteuer"*).

4. The *"Konzessionsabgabe"* (concession fee) that exists for electricity also applies to natural gas consumption. However, as consumers with an annual consumption of more than 5 GWh are exempted, it is not relevant in the framework of this study.

¹⁰⁵ Energiesteuergesetz, §54, 55.

¹⁰⁶ In very specific cases, further reductions are possible. We have not included these in our report.

¹⁰⁷ Energiesteuergesetz, §25.

5.3 France

Component 1 - the commodity price

The commodity price for gas in France used to be based on the market prices in two different market areas (PEG Nord and TRS). As a result, the merger of these two market areas into TRF (PEG) as of November 1st 2018, we present the results for the unique price zone. Commodity prices prior to the merger are computed based on a weighted average of North and South regions' annual volume consumption¹⁰⁸.

For both profiles G1 and G2, the commodity price for France reflected in this study is the monthly prices observed during the previous calendar year (until October 2018) for PEG Nord and TRS. Prices observed for the last couple of months of the year for TRF (PEG) are then used.

This average tackles the non-intuitive results obtained with the previous methodology, as commodity prices can differ strongly from one month to another, and mitigates large differences of commodity prices between countries due to specific situations within a certain period of the year. All commodity data were provided by the CREG.

Component 2 - the network costs

Transmission costs

As previously stated, there are two Transmission System Operators (TSOs) in charge of the gas transport network: GRTGaz and TIGF (Transport et Infrastructures Gaz France). Similarly, to commodity prices, transmission costs are computed based on a weighted average of TSOs' annual gas offtakes.

Their transmission tariffs are built along the same methodology, and made of three main components for end users on the transmission grid:

- 1. *A fixed charge* per year per delivery station;
- 2. An entry capacity fee applicable to daily delivery capacity subscriptions¹⁰⁹;
- *3. A delivery charge (exit capacity fee)* applicable to daily delivery capacity subscriptions for industrial consumers.

Distribution costs

Profile G1 is located on the distribution grid (T4). As previously stated, GrDF (Gaz Réseau Distribution France) delivers 96% of all distributed gas in France¹¹⁰. The tariff has three components:

- 1. *A fixed charge* per year per delivery station (15.795 €);
- 2. *A proportional component* (0,82 €/MWh);
- 3. *A delivery charge* applicable to daily delivery capacity subscriptions (204,48 €/MWh/day).

¹⁰⁸ Since April 1st 2015, a common market area in Southern France, "Trading Region South" (TRS), has replaced the existing PEG TIGF and PEG SUD. On November 1st 2018, TRS and PEG-Nord merged into a single market area (TRF) with a unique *point d'échange de gaz* (PEG).

¹⁰⁹ For the GRTGaz network we present an average of the entry capacity fees of four border entry points Dunkerque, Obergailbach, VIP Virtualys (former Tasnières H) and Tasnières B, weighed by their respective contracted annual firm capacity. For the TIGF network there is just one border entry point, Pirineos.

¹¹⁰ <u>http://www.cre.fr/reseaux/infrastructures-gazieres/description-generale#section3</u>



Component 3 - all extra costs

In France, two surcharges apply on gas:

- 1. The "*Contribution tarifaire d'acheminement*" (CTA) is a surcharge for energy sector pensions. For clients connected to the distribution grid, the CTA amounts to 20,8% of the fixed part of the distribution cost (in France, profile G1) and 4,71% of the fixed part of the transmission cost (in France, G2).
- 2. The "*Taxe intérieure sur la consommation de gaz naturel*" (TICGN) is a tax on gas consumption, that amounted to 8,45 €/MWh in 2018.

The reduction or exemption of the TICGN depends on three criteria:

- a. Companies that participate in the carbon market¹¹¹ and that are energy intensive can pay a reduced rate of 1,52 €/MWh;
- b. Companies that belong to a sector with a high risk of carbon leakage and that are energy intensive can pay a reduced rate: 1,60 €/MWh¹¹²;
- c. Companies that do not use natural gas as a fuel (for example as raw materials) are exempted from the TICGN.

As we include the option that profile G2 uses natural gas as a raw material, we will present a range from o C/MWh (totally exempted from the TICGN) to 8,45 C/MWh. As we do not consider the option that profile G1 uses natural gas a raw material or fuel, we will present a range from 1,52 C/MWh (reduced rate) to 8,45 C/MWh for consumer profile G1.¹¹³

5.4 The Netherlands

Component 1 - the commodity price

For both profiles G1 and G2, the commodity price for the Netherlands reflected in this study is the average of all monthly prices observed during the previous calendar year for TTF. Besides, TTF also represents the largest component used to determine Belgian industrial consumers' contracts.

This average tackles the non-intuitive results obtained with the previous methodology, as commodity prices can differ strongly from one month to another, and mitigates large differences of commodity prices between countries due to specific situations within a certain period of the year. All commodity data were provided by the CREG.

Component 2 - the network costs

Transmission costs

The gas transmission network in the Netherlands serves distribution networks and direct exit points. Given the nature of the Dutch grid¹¹⁴, we assume both profiles G1 and G2 have high-pressure connections and are directly connected to an exit point

¹¹¹ Arrêté du 24 janvier 2015 fixant la liste de exploitants auxquels sont affectés des quotas d'émission de gaz à effet de serre et le montant des quotas affecté à titre gratuit pour la période 2013-2020, appendices 2 and 3.

¹¹² 2014/746/UE: Décision de la Commission du 27 octobre 2014 établissant, conformément à la directive 2003/87/CE du Parlement européen et du Conseil, la liste des secteurs et sous-secteurs considérés comme exposés à un risque important de fuite de carbone, pour la période 2015-2019.

¹¹³ Other reductions are possible, for example when gas is used for electricity production or when biogas is injected in the network (Article 266 quinquies du code des douanes)

According to the Gas Act (Article 10, paragraph 6b), it is the duty of the Dutch TSO, Gasunie Transport Services to provide an applicant with a connection point if the connection has a flow rate greater than 40 m³ per hour.



on the transport network. Therefore, they are only required to pay transmission tariffs to the TSO (Gasunie). These transmission tariffs are composed of:

- 1. *Exit capacity fee* (depends on the exit point and capacity contracted);
- 2. *Balancing tariff* (standard fee for all users to make up for pressure differences on the transport grid, payable for both the entry and exit capacity, in function of capacity contracted);
- 3. *Existing connection fee* (standard fee for all users to make op for the maintenance costs related to the transport grid, payable for the exit capacity only, in function of capacity contracted);
- 4. *Quality conversion fee* (standard fee for all directly connected users to make up for the costs related to converting gas, payable for both the entry and exit capacity, in function of the capacity contracted).

In the Netherlands, a large part of the network is supplied with so-called "Groningen-gas". This gas has a lower calorific value (L-gas) than the gas used in most of Western Europe (H-gas). The Dutch transmission tariffs are fixed in terms of capacity and expressed in C/kWh/h/year, which evens out this calorific value effect.

Gasunie does not disclose the calculation methodology of the individualized rate of the entry and exit capacity fees (which makes up for over 80% of total network costs). It provides the entry capacity fees of 15 entry points for which we will present an average. It also provides the exit capacity fees of +/- 300 directly connected industrial consumers and which type of gas (H, G or G+) they consume. We will therefore present a weighted average of the exit capacity fees based on the share every type of gas has in the total number of connections of the +/- 300 directly connected industrial consumers¹¹⁵.

Component 3 - all extra costs

Two surcharges apply to the gas bill for industrial consumers in the Netherlands:

1. *Energy Tax*, or "Regulerende Energiebelasting" (REB) is a digressive tax on all energy carriers. The table below shows the 2019 rates for each band of gas consumption:

Band	Consumption level	Rates
Band A	Consumption up to 170.000 m ³	0,2931 €/m ³
Band B	Consumption from 170.000-1.000.000 m ³	0,0654 €/m³
Band C	Consumption from 1.000.000-10.000.000 m ³	0,0238 €/m³
Band D	Consumption above 10.000.000 m ³	0,0128 €/m³

A lowered tariff exists, but only for (especially agricultural) heating installations. We assume our profiles do not benefit from the lowered tariffs.

2. *The ODE levy* ("Opslag duurzame energie") is a digressive levy on gas and electricity that pays for renewable capacity. Rates for 2019 are reported in the table below:

Band	Consumption level	Rates
Band A	Consumption up to 170.000 m ³	0,0524 €/m ³
Band B	Consumption from 170.000-1.000.000 m ³	0,0161 €/m³
Band C	Consumption from 1.000.000-10.000.000 m ³	0,0059 €/m ³

¹¹⁵ From this list, we have not taken into account the tariffs paid by very particular consumers such as gas-fired power plants.

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Band D Consumption above 10.000.000 m³ 0,0031 €/m³

A lowered tariff also exists for the ODE levy, but only for (especially agricultural) heating installations. We assume our profiles do not benefit from the lowered tariffs.

As the Energy tax and ODE Levy are fixed in euros per volume units (\mathbb{C}/m^3) and not in euros per energy units, the calorific value of the used gas has an impact on the total amount paid. We propose again to use a weighted average in function of the calorific value distribution of all industrial gas users directly connected to the transport grid in the Netherlands.

As it is the case for electricity in the Netherlands, there are also several exemptions and reductions on these tax surcharges for gas, but with slightly different conditions than those applied for electricity.

Industrial consumers are eligible for an exemption of taxes when one of the following conditions is met:

- 1. Gas has been used to produce electricity in a plant with an efficiency of over 30% or when it has been used to generate electricity in a plant exclusively with renewable energy sources;
- 2. Gas that has not been used as a fuel or gas that has been used as an additive or filler substance;
- 3. Gas has been used in metallurgic and mineralogical processes;
- 4. Gas has been used as fuel for commercial navigation.

Furthermore, as is the case for electricity, there is also a tax refund scheme ('teruggaafregeling') for gas but as it is not applicable for our consumer profiles¹¹⁶, we will not discuss it in this section.

As we do not consider profile G1 as consumer using gas as a fuel or gas that has been used as an additive or filler substance, we present the maximum option (no refund applicable) for profile G1.

As we included the option that profile G2 can represent a large consumer using gas as a feedstock for its industrial processes, we assume that it can apply for an exemption of taxes and we therefore present a range between the minimal option (totally exempted from taxes) to the maximum option (no refund applicable) for this consumer profile.

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¹¹⁶ The tax refund scheme applies to public and religious institutions such as clinics, schools, sport centres, churches, etc.

5.5 United Kingdom

Component 1 - the commodity price

For commodity in the UK, we use the NBP (National Balancing Point) market index.

For both profiles G1 and G2, the commodity price for the UK reflected in this study is the average of all monthly prices observed during the previous calendar year for NBP.

This average tackles the non-intuitive results obtained with the previous methodology, as commodity prices can differ strongly from one month to another, and mitigates large differences of commodity prices between countries due to specific situations within a certain period of the year. All commodity data were provided by the CREG.

Component 2 - the network costs

Transmission costs

The national transmission system in the UK (except for Northern Ireland) is operated by one single entity: National Grid Gas.

The Gas Transmission Transportation Charges are comprised of the following components:

- 1. *Entry capacity charge:* capacity charges are payable to bring gas on to the system irrespective of whether or not the right is exercised based on peak demand capacity;
- 2. *Exit* capacity charge: capacity charges are to take gas off the system irrespective of whether or not the right is exercised based on peak demand capacity;
- 3. *Commodity charge:* a charge per unit of gas transported by NTS¹¹⁷ payable for flows entering and exiting the system (see above, cumulative).

National Grid Gas provides a weighted average of the entry and exit capacity tariffs in their Statement of Gas Transmission Transportation Charges.¹¹⁸

Distribution costs

Given the fact that profile G1 is connected to the distribution grid, distribution and transmission tariffs have to be paid. As previously stated, the UK has eight DSOs for gas, amongst which four are owned by Cadent Gas. The distribution tariff for gas is composed of:

- 1. LDZ system capacity charge;
- 2. LDZ system commodity charge;

LDZ charges are based on functions, these functions use Supply Point Offtake Quantity (SOQ) in the determination of the charges. This SOQ is calculated in terms of peak day kWh (e.g. 300.000 peak day kWh for our profile G1);

3. LDZ customer capacity charge: the customer charge for our profile G1 is also based on a function related to the registered Supply Offtake Quantity (SOQ);

¹¹⁷ National Transmission System

 $^{^{\}rm 118}~$ We have used the weighted averages published in the Gas Transmission Transportation Charges of the NGG from the 1st of October 2016.



4. *LDZ Exit capacity* (corresponding to transmission tariffs): this is a capacity charge that is applied to the supply point in the same manner as the LDZ system capacity charge. These charges are applied per exit zone on an administered peak day basis.

We present an average of these components across all DSOs for gas active in the UK.

Component 3 – all extra costs

In the United Kingdom, one single levy is applied on gas consumption: the Climate Change Levy (CCL). The CCL is payable on electricity, gas, fuel, etc. The standard rate for natural gas is 0,203 p/kWh (about 2,29 €/MWh), but consumers who are part of Climate Change Agreement get a 35% reduction. We assume that profile G1 is an economically rational actor and benefits from the reduced rate of +/- 1,49 €/MWh.

Consumers that do not use natural gas as a fuel, but rather as a feedstock, are exempted from the climate change levy. As in other countries, we included the option that profile G2 can be such a consumer and hence we present a range from 0 C/MWh (exempted from the Climate Change Levy) to +/- 1,49 C/MWh (reduction when being part of Climate Change Agreement).

6. Presentation and interpretation of results



6. Presentation and interpretation of results

6.1 Interpretation of figures (Electricity)

Figure A: Total yearly invoice

	Symbol	Legend	Interpretation
Graph 1 Total yearly invoice (€/year)	881	Maximum option (non- electro intensive)	Applies to Germany, if the full eEG tax is applicable; to France, if the full CSPE tax is applicable and to the Netherlands, if the Energy tax is applicable
	726 656	Maximum option (electro- intensive)	Demonstrates the range of points between the minimum option for electro-intensive consumers and the
		Minimum option (electro- intensive)	maximum option (with regards to taxes/levies/certificate scheme) regarding the national criteria
	2,167	Single result	No range is presented (only one level of taxes/certificate scheme)

Figure B: Total yearly invoice comparison (Belgium 2019 = 100)

	Symbol	Legend	Interpretation
Graph 2 Yearly invoice comparison (Belgium 2019 = 100)	169	Maximum option (non- electro intensive)	Applies to Germany, if the full eEG tax is applicable ; to France, if the full CSPE tax is applicable and to the Netherlands, if the Energy tax is applicable
	82 73	Maximum option (electro- intensive)	Demonstrates the range of points between the minimum option for electro-intensive consumers and the
		Minimum option (electro- intensive)	maximum option (with regards to taxes/levies/certificate scheme), if applicable
	106	Single result	No range is presented (only one level of taxes/certificate scheme)

Figure C: Average power price by component / MWh

Graph 3 Average power price by component (€/MWh)	Symbol	Legend	Interpretation
	57·3	Commodity	Represents the total commodity cost
	27.5	Network	Represents the total network cost in BE, DE, NL and UK
		Network - minimum	Represents the minimum network cost for electro-intensive consumers in FR
	₩	Network - maximum	Represents the possible range between minimum and maximum network cost for electro- intensive consumers in FR



15.6	Taxes/Levies	Represents the cost of taxes/levies/certificate scheme in BE and UK
///	Taxes/Levies - minimum (electro-intensive)	Represents the minimum cost of taxes/levies/certificate scheme for electro-intensive consumers in FR, DE and NL
	Taxes/Levies - maximum (electro-intensive)	Represents the possible range between minimum and maximum cost of taxes/levies/certificate scheme for electro-intensive consumers in FR, DE and NL
14.1	Taxes/Levies/Certificates scheme - maximum (non- electro-intensive)	Applies to Germany, if the full eEG tax is applicable; to France, if the full CSPE tax is applicable and to the Netherlands, if the Energy tax is applicable
	<i>///</i>	Indicorder for the second s

6.2 Profile E1 (Electricity)

Total invoice analysis

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Figure 1 provides a comparison of the total yearly invoices paid by the reference consumer belonging to profile E1 in the various countries under review. Results are expressed in k€/year

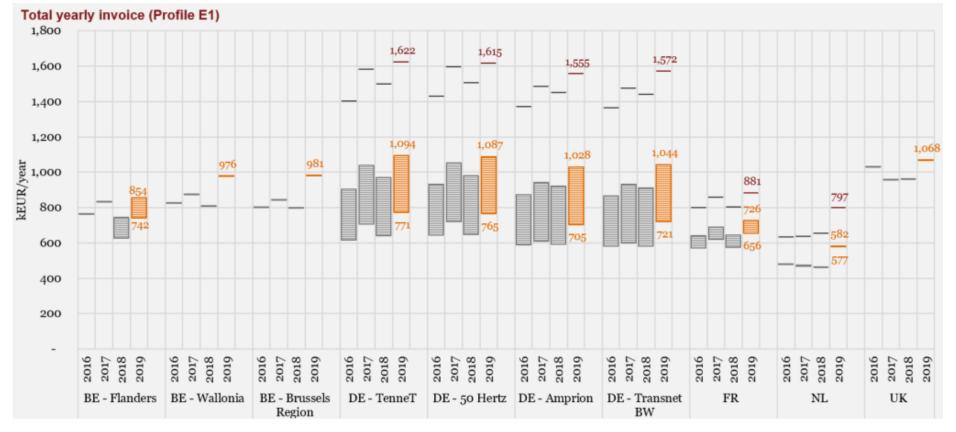


Figure 1 – Total yearly invoice in $k \in /year$ (profile E1)

For an extensive legend for all figures, see section 6.1.



Belgium is split in three regions and Germany in four regions, while only one single result is presented for the UK, France and the Netherlands. For the UK and the Netherlands, reported data correspond to averaged values driven from the sub-regions.

For the purpose of facilitating the comparison, in Figure 2 the same results are compared to the reference situation which relates to the average of the three Belgian regions (Belgian average in 2019 = 100%).

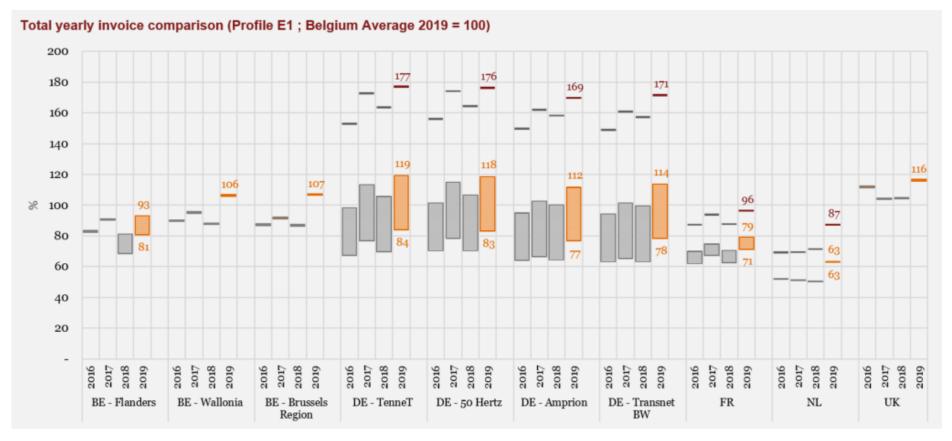


Figure 2 – Total yearly invoice comparison in % (profile E1)

For an extensive legend for all figures, see section 6.1.



All countries from our sample show higher prices in 2019 than in 2018¹¹⁹.

The three Belgian regions still show slightly different results, with the Flemish region slightly more competitive and the Walloon and Brussels-Capital regions slightly less competitive than the Belgian average. For the most electro-intensive consumers in the Flemish region, benefiting from the super-cap on green certificates, the competitive position is comparable to the one of most electro-intensive consumers in Germany.

As a whole, Belgium is less competitive than the Netherlands and more competitive than the UK for all consumers. As for electro-intensive consumers, Belgium is less competitive than France. When compared to non-electro-intensive consumers, Belgium is more competitive than Germany.

The detailed analysis of the German apparent lower competitiveness (when maximal options are considered) should be assessed carefully because of the large variance that occurs between the minimum and maximum options (including the EEG maximum option for consumers that are not electro-intensive according to the national criteria) that mainly depends on the relative size of power costs in their gross added value: when average annual electricity cost over the last three years represents less than 14% of the gross added value of an industrial consumer, the consumer inevitably pays the maximum rate.

The French higher competitiveness is partly explained by the reductions applicable to the *"Contribution au service public d'électricité"* (CSPE) for consumers that are classified as (very) electro-intensive (as previously stated).

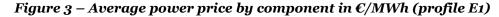
¹¹⁹ As stated in p.56, please note that as the indirect costs related to the capacity markets in the UK are not taken into account, results for the electricity cost in the UK are slightly underestimated.

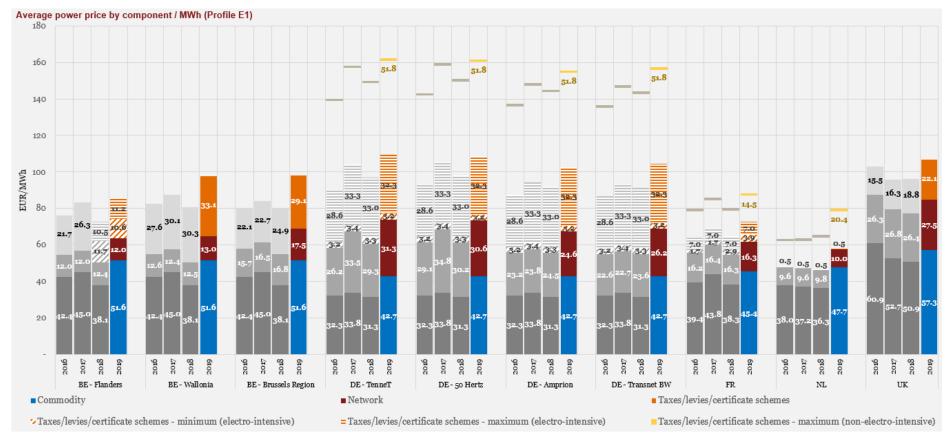
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Breakdown by component

The previous results are further detailed for profile E1 in Figure 3 which provides a closer look at the components breakdown.





For an extensive legend for all figures, see section 6.1.In 2018, the so-called super cap was introduced in Flanders, which in the case of electro-intensive consumers could lead to a lower cost for the component "Taxes, levies and certificate schemes". In case the super cap is awarded, an electro-intensive consumer that meets the criteria (see page 39) can obtain a reduction of this component. This reduction can range from a maximum amount of $11,2 \in /MWh$ (if the consumers' Gross Value Added over the last three years is of $0 \in$) to a minimum amount of $0 \in$ (when the amount due with the supercap exceeds the cost of the green certificates scheme).



In all cases, **commodity prices** increased compared to last year. Commodity cost in Germany is still the lowest, while French and Dutch commodity costs for E1 consumers are lower than in Belgium where the increase was the most important. All three countries (FR, NL, BE) remain significantly higher than in Germany. Commodity costs in the UK increased in a relatively similar way to other countries. As opposed to the previous year, this increase was not offset by any exchange rate effect given the relatively similar exchange rate. The UK commodity component remains markedly higher than in the other countries.

In all regions and/or countries, **network costs** (which include transmission and distribution costs for this profile) contribute to a variable extent of the invoice. In this respect, the Netherlands and to a lesser extent Belgium and France are more competitive than the other countries/regions of comparison. Network costs are especially high in Germany and the UK where they can be nearly three times higher than in the most competitive country/region (the Netherlands). Compared to 2018, an important increase of network costs for two of the four German regions: TenneT and Transnet BW can be noticed, mainly due to the transmission part of the network costs.

The third component, "**taxes, levies and certificates schemes**", has a large impact in all countries. Compared to 2018, this component increased in Wallonia, the Brussels-Capital region, the Netherlands and the United Kingdom (due to a higher cost of the Renewables Obligation Certificates). The component decreased in the Flemish region (due to a lower federal contribution resulting from lower tariffs as DSOs perceived excessive amounts of money from larger renewable energy production), and very slightly in Germany and France. As discussed before, the German situation offers the potential for very low values for very electro-intensive companies as well as the highest values. The French levels for electro-intensive consumers are comparable to those in Germany, while the Netherlands offer the lowest tax levels for electro-intensive consumers. Important differences are observed between the three Belgian regions, with the Walloon region being more expensive than the other regions.



KEY FINDINGS

The first electricity profile (E1) analysis leads to the following findings:

- We observe very important differences between the countries under review and even within the countries: a possible total invoice for profile E1 can vary between 577 k€ and 1.622 k€. Compared to last year, total annual cost increased in all countries.
- *Commodity costs* largely contribute to the total spreads observed and increased globally compared to 2018. Although commodity costs increased globally, the magnitude differed from one country to another. Belgium and the Netherlands faced the most significant increase leading to a greater competitive disadvantage towards Germany. Over two years France reversed its position to now own a competitive advantage over the Netherlands. Germany shows the lowest commodity prices, while the United Kingdom saw its already high commodity component increasing even further.
- *Network costs* usually absorb a variable but possibly substantial part of the total bill. They also diverge between the different countries/regions. They are the highest in the United Kingdom and in Germany (where large regional differences exist) and lowest in the Netherlands. Belgium remains a relatively competitive country with regard to network costs.
- *Taxes, levies and certificates schemes* are characterised by a large variance, and saw a decrease in 2019 in the Flemish region, and an increase in the Brussels-Capital region. This component decreased slightly in Germany, remained stable in the Netherlands, and increased in France and the United Kingdom. They are relatively high in the Walloon region and rather important in the other Belgian regions and the UK. For electro-intensive consumers, tax levels are relatively low in Germany and France and almost inexistent in the Netherlands. In Germany, the situation is mixed, depending on the electro-intensity of the consumer. In this respect, the range between the best and the worst situation is high as it can reach more than two times the size of the commodity cost.



6.3 Profile E2 (Electricity)

Total invoice analysis

Figure 4 provides a comparison of the total yearly invoices paid by profile E2 in the various countries under review. Results are expressed in k€/year.

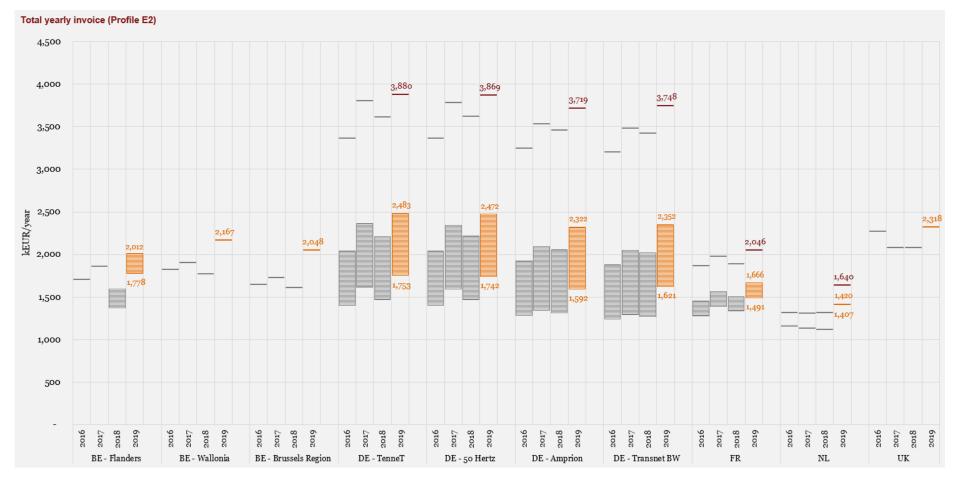


Figure 4 – Total yearly invoice in k€/year (profile E2)

For an extensive legend for all figures, see section 6.1.

Again, Belgium is split in three regions and Germany in four regions, while only one single result is presented for the UK, France and the Netherlands. For the UK and the Netherlands, reported data correspond to averaged values driven from the sub-regions.

For the purpose of facilitating the comparisons, in Figure 5 the same results are compared to the reference situation which relates to the average of the three Belgian regions (Belgian average 2019 = 100%).

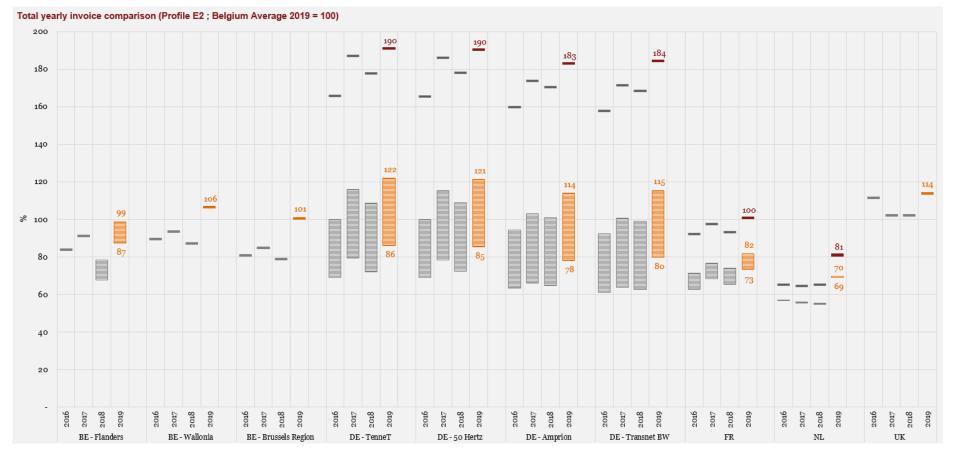


Figure 5 – Total yearly invoice comparison in % (profile E2)

For an extensive legend for all figures, see section 6.1.



Compared to 2018, all countries from our sample show higher prices.

As a whole, Belgium is less competitive than the Netherlands and more competitive than the UK for all consumers. Besides, Belgium is less competitive than France for electro-intensive consumers. For the most electro-intensive consumers in the Flemish region however, benefiting from the super-cap on green certificates, the competitive position is comparable to the one of most electro-intensive consumers in Germany depending on the region (TenneT and 50 Hertz). When compared to non-electro-intensive consumers in Germany, Belgium is more competitive.

Like for profile E1, the United Kingdom is an outlier.

The detailed analysis of the German apparent lower competitiveness (when maximal options are considered) should be assessed carefully because of the large variance that occurs between the minimum and maximum options (including the EEG maximum option for consumers that are not electro-intensive according to the national criteria) that mainly depends on the relative size of power costs in their gross added value: when average annual electricity cost over the last three years represents less than 14% of gross added value of an industrial consumer, the consumer inevitably pays the maximum rate.

The French higher competitiveness (except maximum case) is partly explained by the reductions applicable to the *"Contribution au service public d'électricité"* (CSPE) for consumers that are classified as (very) electro-intensive (see above).



Breakdown by component

The previous results are further detailed for the profile E2 which provides a closer look at the components breakdown.

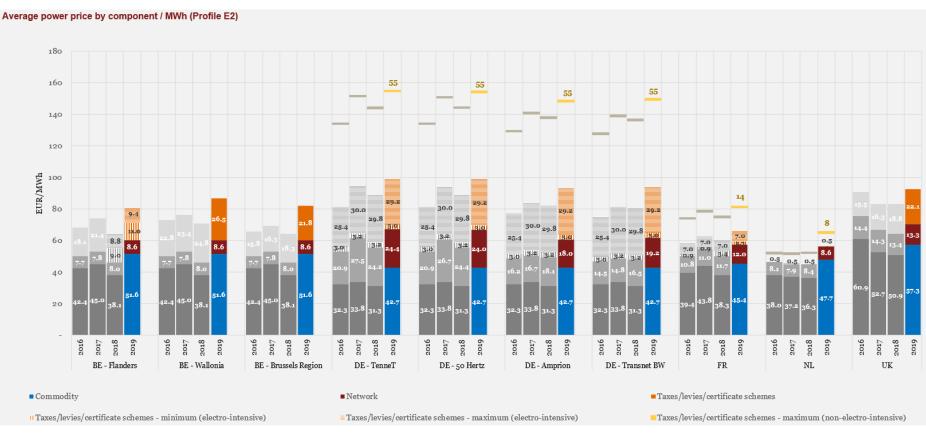


Figure 6 – Average power price by component in \mathcal{E} /MWh (profile E2)

Foranextensivelegendforallfigures,seesection6.1.In 2018, the so-called super cap was introduced in Flanders, which in the case of electro-intensive consumers could lead to a lower cost for the component "Taxes, levies and certificate schemes". In
case the super cap is awarded, an electro-intensive consumer that meets the criteria (see page39) can obtain a reduction of this component. This reduction can range from a maximum amount of
9,4 €/MWh (if the consumers' Gross Value Added over the last three years is of o €) to a minimum amount of o € (when the amount due with the supercap exceeds the cost of the green certificates
scheme).



In terms of commodity cost, we have to remember that profile E2 has the same consumption and load profile as profile E1; their commodity cost per MWh is the same. In most cases, the **commodity** makes up for the largest part of the bill. Commodity prices increased in all countries compared to last year. Belgium and the Netherlands faced important surge of the commodity cost bringing the commodity component of Dutch consumers to a higher level than in France for the first time over the course of this study. Commodity cost in Germany is still the lowest, while they remain markedly higher in the UK than in the other countries. As opposed to the previous year, the commodity cost increase in the UK was not offset by any exchange rate effect given the relatively similar exchange rate.

In all countries, **network costs** contribute to a variable extent to the invoice. Belgium and the Netherlands present the lowest network costs, followed by France. The UK and the four German zones have the highest network costs. This is partly – but not entirely - due to the fact that in these countries (UK and Germany), profile E2 not only pays transmission but also distribution charges. Compared to 2018, network charges in the Amprion and 50 Hertz regions slightly decreased while they increased in the TenneT and Transnet BW zones.

The third component "taxes, levies and certificates schemes" has a (potentially) large impact in all countries. Compared to 2018, this component has become more expensive across all Belgian regions in the Brussels-Capital Region (due to an increase in the cost for financing of Green Certificates), and the United Kingdom (due to an increased cost of Renewables Obligation Certificates). As discussed before, the German situation offers the potential for very low values for very electro-intensive companies as well as the highest values. For electro-intensive consumers, the Dutch tax levels are the lowest (almost inexistent), followed by the French and German tax levels. For the most electro-intensive consumers benefiting from the super cap on the green certificate quota in Flanders, this component is considerably less expensive than in Wallonia or Brussels, but still higher than in Germany, France or the Netherlands. For non-electro-intensive consumers, the Dutch competitive advantage is even more important, while the highest values can be found in the Walloon Region and Germany (high range). Yet again, we observe relatively important differences between the Belgian regions, with the Flemish region remaining the most competitive among all three.

The particularly competitive prices for the Dutch case can be partly explained by the tax refund scheme ('teruggaafregeling') destined for industrial consumers who are classified as energy-intensive and who concluded a multiple-year agreement with the Dutch government to save energy by improving their energy efficiency (see previously), but also through the very competitive network costs and generally low tax levels.

As already mentioned, the German position should be assessed in line with the large variance characterizing minimum and maximum "taxes, levies and certificate schemes" which – in the least favourable situation for consumers that do not qualify as electro-intensive - can be bigger than commodity and network costs combined.



KEY FINDINGS

The second electricity profile (E2) analysis leads to the following findings:

- We observe very important differences between the countries under review and even within the countries: a possible total annual invoice for profile E2 can vary between 1,41 M€ and 3,88 M€. Compared to last year, total cost increased in all countries of our sample. The commodity cost is the common driver to the total cost uptrend.
- Belgium is not very well positioned compared to other countries in terms of total electricity cost, especially the Walloon and (to a lesser extent) Brussels-Capital region. The Netherlands is by far the most competitive country under review, for electro-intensive as well as non-electro-intensive consumers. Prices in France and two of the four German regions (electro-intensive consumers) are within a very close range. Like for profile E1, the United Kingdom is an outlier.
- *Commodity costs* largely contribute to the total bill and globally increased compared to 2018. The Belgian competitive disadvantage compared to France largely widened because of the highest magnitude of commodity increase in Belgium. The Netherlands shows a larger commodity component than France for the first time over the course of this study. The commodity component remains the lowest in Germany, while the United Kingdom deals with a considerably higher commodity price.
- *Network costs* absorb a variable but possibly substantial part of the total bill. They also diverge between the different countries/regions. They are the highest in Germany (especially in the 50 Hertz and TenneT regions) and in the UK, partly due to presence of distribution charges in those countries. Belgium and the Netherlands are the most competitive countries for network costs, as it is the case for E1.
- Taxes, levies and certificates schemes are characterised by a large variance. They increased across all three regions of Belgium (financing of green certificate). This component also increased in the United Kingdom (increased cost of Renewables Obligation Certificates), and remained stable in Germany, the Netherlands and France. They are rather important in Belgium, especially in the Walloon region, while they remain very low in the Netherlands, even for non-electro-intensive consumers. In Germany and France (and to a lesser extent in Flanders), the situation is mixed, depending on the electro intensity according to national criteria. In this respect, the range between the best and the worst situation in Germany is high as it can reach about the same size of commodity cost and network cost combined.



6.4 Profile E3 (Electricity)

Total invoice analysis

Figure 7 provides a comparison of the total yearly invoices paid by profile E3 in the various countries under review. Results are expressed in k€/year.

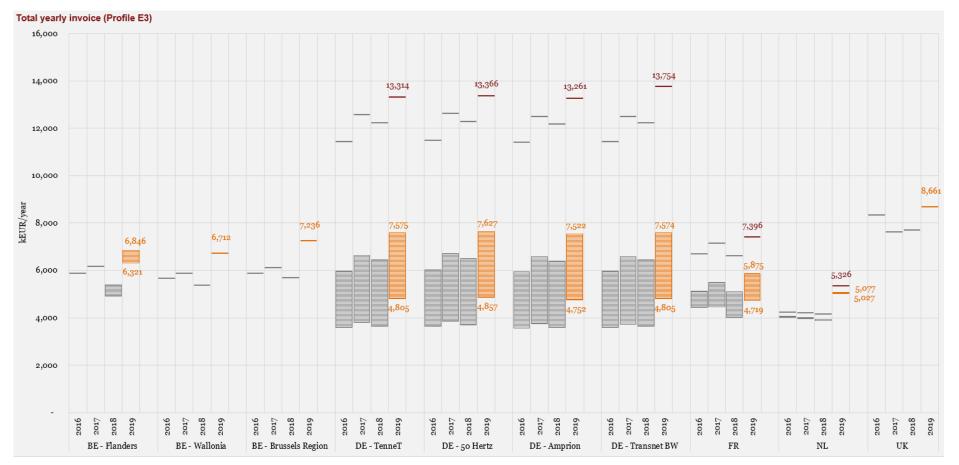


Figure 7 – Total yearly invoice in $k \in /year$ (profile E3)

For an extensive legend for all figures, see section 6.1



Again, Belgium is split in three regions and Germany in four regions, while only one single result is presented for the UK, France and the Netherlands. For the UK and the Netherlands, reported data correspond to averaged values driven from the sub-regions.

For the purpose of facilitating the comparisons, in Figure 8 the same results are compared to the reference situation which relates to the average of the three Belgian regions (Belgian average 2019 = 100%).

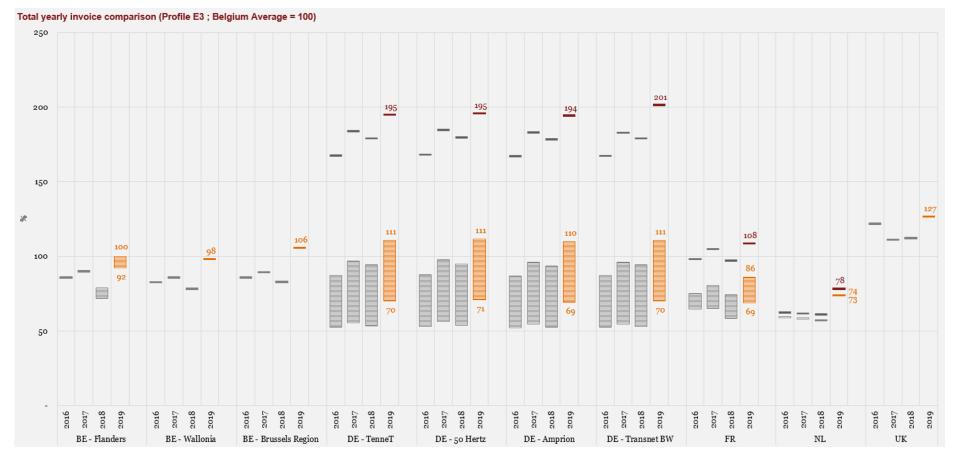


Figure 8 – Total yearly invoice comparison in % (profile E3)

For an extensive legend for all figures, see section 6.1.



As it was the case for profile E1 and E2, total cost increased compared to 2018 in all countries under scrutiny¹²⁰.

As a whole, Belgium is less competitive than the Netherlands and more competitive than the UK for all consumers. Besides Belgium is less competitive than France electro-intensive consumers. When compared to non-electro-intensive consumers in Germany and France, Belgium is more competitive. For this profile, the Walloon region offers a lower electricity cost than the Flemish and Brussels regions for non-electro intensive consumers due to targeted reductions of the green certificate quota. Since the 2018 introduction of the cap and super cap in Flanders on the green certificate quota, the most electro-intensive consumers in Flanders can nevertheless obtain a total cost lower than in Wallonia if they benefit from the super-cap. As it is the case for all electricity profiles, the United Kingdom is an outlier.

The detailed analysis of the German apparent lower competitiveness (when maximal options are considered) should be assessed carefully because of the large variance that occurs between the minimum and maximum options (including the non-electro intensive case for consumers that are not electro-intensive according to the national criteria) that mainly depends on the relative size of power costs in their gross added value: when average annual electricity cost over the last three years represents less than 14% of gross added value of an industrial consumer, the consumer inevitably pays the maximum rate.

For profile E3, the competitiveness of prices levels in the Dutch case can only very partly be attributed to the tax refund scheme ('teruggaafregeling') destined for industrial consumers who are classified as energy-intensive and who concluded a multiple-year agreement with the Dutch government to save energy by improving their energy efficiency. Given the digressive nature of the Energy tax, the Netherlands offers by far the most competitive prices for non-electro intensive consumers, regardless of their level of electro-intensity.

¹²⁰ Please note that as the indirect costs related to the capacity markets in the UK are not taken into account, results for the electricity cost in the UK are slightly underestimated.

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Breakdown by component

The previous results are further detailed for the profile E3 in Figure 9 which provides a closer look on the components breakdown.

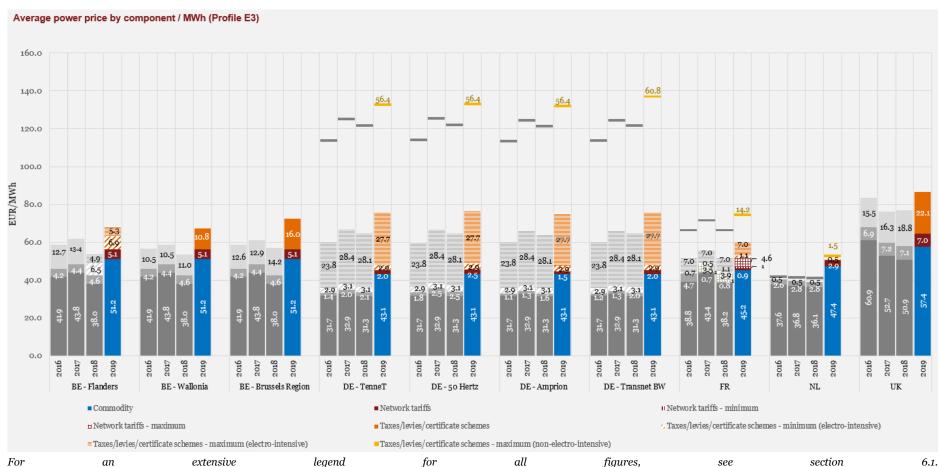


Figure 9 – Average power price by component in €/MWh (profile E3)

In 2018, the so-called super cap was introduced in Flanders, which in the case of electro-intensive consumers could lead to a lower cost for the component "Taxes, levies and certificate schemes". In case the super cap is awarded, an electro-intensive consumer that meets the criteria (see page39) can obtain a reduction of this component. This reduction can range from a maximum amount of $5,3 \in /MWh$ (if the consumers' Gross Value Added over the last three years is of $o \in$) to a minimum amount of $o \in$ (when the amount due with the supercap exceeds the cost of the green certificates scheme).



Even more so than for profiles E1 and E2, **commodity cost** plays a major role. Commodity prices globally increased compared to last year. Despite an important rise of the commodity component, Germany is still the lowest while France and the Netherlands keep their competitive advantage towards Belgium. Yet, the Netherlands now show a higher commodity component than France. Commodity costs in the UK remain markedly higher than in the other countries. As opposed to the previous year, the commodity cost increase in the UK was not offset by any exchange rate effect given the relatively similar exchange rate.

For profile E3, **network costs** only constitute a limited part of the total invoice. Large baseload consumers in the UK and Belgium pay higher transmission tariffs than those in the Netherlands, France and Germany. This is explained by the fact that in those three countries, large baseload consumers such as E3 in this study can benefit from transport tariff reductions (85% in Germany, 45% in the Netherlands and between 10 and 85% in France depending on electro-intensity). These reductions profoundly alter the situation in terms of network costs, and by doing so the general picture in terms of competitiveness, especially for Germany where network costs are the highest of all countries under review if there are no reductions.

Taxes, levies and certificates schemes play a variable role that strongly depends on the electro-intensity of the consumer. Compared to 2018, their general level increased in Flanders and in the Brussels-Capital region (green certificate quota) and the UK (cost of Renewable Obligation Certificates), while decreasing slightly in the Walloon region and in all regions in Germany. Nevertheless, for this component, the Walloon region offers a lower cost than the Flemish and Brussels-Capital regions due to targeted reductions of the green certificate quota. However, since the 2018 introduction of the cap and super cap on green certificate quota in the Flemish region, this conclusion no longer holds when compared to Flemish electro-intensive consumers that benefit from the super-cap. This component did not change in the Netherlands and France. They can have a relatively large impact in the United Kingdom and Belgium (where differences between regions are smaller than for the profiles E1 and E2), particularly on electro-intensive consumers for whom no specific reductions exist in these countries (except for the super-cap in Flanders).

For non-electro-intensive consumers (depending on local criteria), taxes in Germany, France and the UK are higher than in Belgium. Dutch consumers, whether electro-intensive or not, benefit from the lowest cost of taxes, levies and certificates schemes. Generally speaking, German taxes and levies compensate part (or all) of the competitive advantage that is built up through the low commodity cost - depending on the exact amount of taxes that has to be paid.



KEY FINDINGS

The third electricity profile (E3) analysis leads to the following findings:

- We observe very important differences between the countries under review: a possible total invoice for profile E3 can vary between 4,72 M€ and 13,75 M€. Compared to last year, total annual cost rose in all countries.
- As opposed to profiles E1 and E2, for this profile, the Walloon region offers a lower electricity cost than the Flemish and Brussels-Capital regions due to targeted reductions of the green certificate quota.
- *Commodity costs* play a very important role. In this respect, Belgium and the Netherlands have higher commodity costs than Germany and France. Germany has a substantial competitive advantage, while the UK remains more expensive.
- *Network costs* are responsible for a relatively small part of the bill. Important reductions in Germany, France and the Netherlands make low (UK) to very low (Belgium) transmission tariffs be a competitive disadvantage as they are higher. Transmission tariff reductions for large baseload consumers constitute a sizeable competitive advantage for France and the Netherlands, but especially for Germany were the base rates of transmission tariffs are by far the highest of all cases under review.
- *"Taxes, levies and certificates schemes"* are characterised by a large variance. They are high in the United Kingdom and rather important in Belgium while they remain very low in the Netherlands, even for non-electro intensive consumers. In France and Germany the situation is mixed, depending on the taxation scheme implemented at company level. In this respect, paying the high end of the German tax range can mean more than doubling the total electricity cost of a low end scenario.



6.5 Profile E4 (Electricity)

Total invoice analysis

Figure 10 provides a comparison of the total yearly invoices paid by profile E4 in the various countries under review. Results are expressed in k€/year.

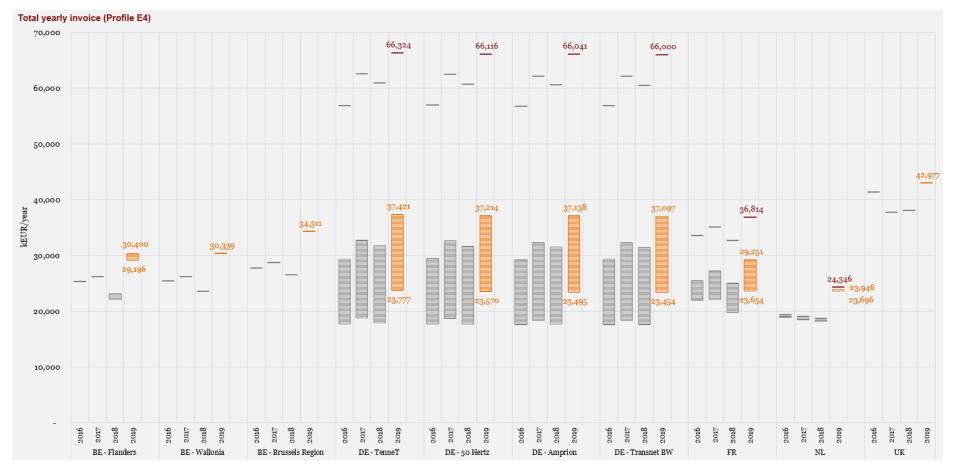


Figure 10 – Total yearly invoice in $k \in /year$ (profile E4)

For an extensive legend for all figures, see section 6.1.

 $\rm CREG-A$ European comparison of electricity and gas prices for large industrial consumers 25 April 2019

Again, Belgium is split in three regions and Germany in four regions, while only one single result is presented for the UK, France and the Netherlands. For the UK and the Netherlands, reported data correspond to averaged values driven from the sub-regions.

For the purpose of facilitating the comparisons, in Figure 11 the same results are compared to the reference situation which relates to the average of the three Belgian regions (Belgian average 2019 = 100%).

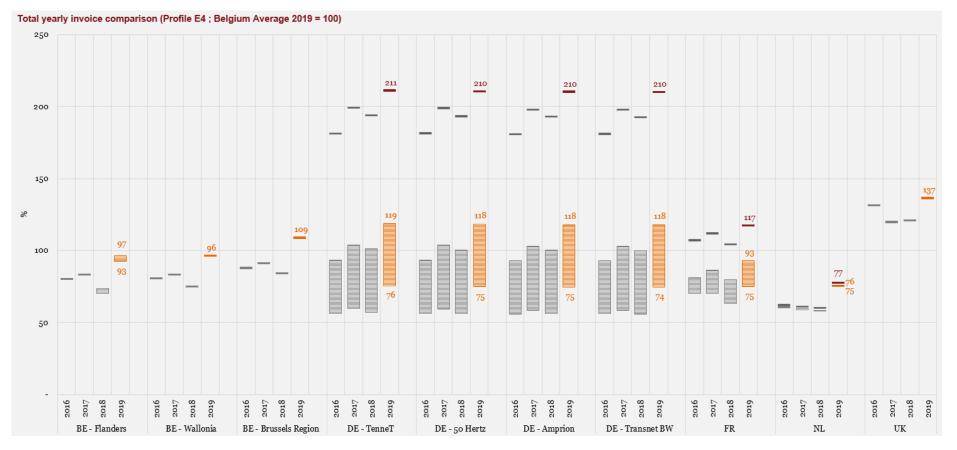


Figure 11 – Total yearly invoice comparison in % (profile E4)

For an extensive legend for all figures, see section 6.1.



As it was the case for all other consumer profiles, total electricity cost increased compared to 2018 in all countries.

Belgium is less competitive than the Netherlands and more competitive than the UK for all consumers. Besides, Belgium is less competitive than France for electrointensive consumers (except for the unique case of Flanders' minimum cost and France's maximum cost). Since the 2018 introduction of the cap and super cap in Flanders on the green certificate quota, the most electro-intensive consumers in Flanders can obtain a total cost lower than in Wallonia if they benefit from the supercap. When compared to non-electro-intensive consumers in Germany and France, Belgian is more competitive. This is true for all three Belgian regions, even though the Flemish and Walloon regions offer a slightly lower electricity cost than the Brussels-Capital region¹²¹. The UK and the German EEG-maximum case are high outliers.

The detailed analysis of the German apparent lower competitiveness (when maximal options are considered) should be assessed carefully because of the large variance that occurs between the minimum and maximum options (including the EEG maximum option for consumers that are not electro-intensive according to the national criteria) that mainly depends on the relative size of power costs in their gross added value: when average annual electricity cost over the last three years represents less than 14% of gross added value of an industrial consumer, the consumer inevitably pays the maximum rate.

For profile E4, the very competitive prices for the Dutch consumers can only very partly be explained by the tax refund scheme ('teruggaafregeling') destined for industrial consumers who are classified as energy-intensive and who concluded a multiple-year agreement with the Dutch government to save energy by improving their energy efficiency. Given the digressive nature of the Energy tax, the Netherlands offers by far the most competitive prices for non-electro intensive consumers, regardless of their level of electro-intensity.

¹²¹ It should be noted that in Brussels there is currently no industrial consumer with the consumption level of profile E4, which could be an explanation for the high taxes in this region.

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Breakdown by component

The previous results are further detailed for the profile E4 in Figure 12 which provides a closer look on the components breakdown.

Figure 12 – Average power price by component in ϵ /MWh (profile E4)



Average power price by component / MWh (Profile E4)

In 2018, the so-called super cap was introduced in Flanders, which in the case of electro-intensive consumers could lead to a lower cost for the component "Taxes, levies and certificate schemes". In case the super cap is awarded, an electro-intensive consumer that meets the criteria (see page 39) can obtain a reduction of this component. This reduction can range from a maximum amount of $2,4 \in /MWh$ (if the consumers' Gross Value Added over the last three years is of $0 \in$) to a minimum amount of $0 \in$ (when the amount due with the supercap exceeds the cost of the green certificates scheme).



In terms of commodity cost, we have to remember that profile E4 has the same load profile as profile E3; therefore, their commodity cost is the same. Commodity prices globally increased compared to last year. Despite an important rise of the commodity component, Germany is still the lowest while France and the Netherlands keep their competitive advantage towards Belgium. Yet, the Netherlands now show a higher commodity component than France. Commodity costs in the UK remain markedly higher in the UK than in the other countries. As opposed to the previous year, the commodity cost increase in the UK was not offset by any exchange rate effect given the relatively similar exchange rate.

For profile E4, **network costs** only constitute a limited part of the total invoice. Large baseload consumers in the UK and Belgium pay higher transmission tariffs than those in the Netherlands, France and Germany. This is explained by the fact that in those three countries, large baseload consumers such as E4 in this study can benefit from transport tariff reductions – even more so than profile E3 (90% in Germany and the Netherlands and between 20 and 90% in France depending on electro-intensity). These reductions profoundly alter the situation in terms of network costs, and by doing so the general picture in terms of competitiveness.

Taxes, levies and certificates schemes play a variable role. For profile E4, the Belgian tax level is considerably lower than for other consumption profiles because the annual caps and maximum digressive rates are applicable for several of the taxes and surcharges. This brings down the tax level for all industrial E4 consumers in Flanders and Wallonia consumers to slightly above the level for electro-intensive consumers in neighbouring countries, but well below top tax levels for non-electro-intensives in France and Germany. Due to the introduction of the super cap on green certificate quota in 2018 in the Flemish region, the most electro-intensive consumers that benefit from the super cap can theoretically pay a lower cost in for this component than German competitors.

Dutch large baseload consumers benefit from the lowest cost of taxes, levies and certificates schemes, even when they do not fit the national criteria for electrointensiveness. Generally speaking, German taxes and levies compensate part (or all) of the competitive advantage that is built up through the low commodity cost (and reduced network tariffs) - depending on the exact amount of taxes that has to be paid.



KEY FINDINGS

The fourth electricity profile (E4) analysis leads to the following findings:

- We observe very important differences between the countries under review: a possible total invoice for profile E4 can vary between 23,45 M€ and 66,32 M€. Compared to last year, total annual cost rose in all countries.
- For Flanders and Wallonia, we observe that the annual caps and digressive rates for several of the taxes and surcharges result in a considerably more competitive cost of taxes, levies and certificates schemes than for the other consumer profiles (including E3).
- *Commodity costs* play a very important role. Like for the other profiles under review, Belgian and Dutch commodity cost are in the same range whereas France edges closer to German commodity cost which are the lowest. Commodity costs in the United Kingdom remain high and are an important factor in the outlier result for the UK.
- *Network costs* are responsible for a relatively small part of the bill. Important reductions in Germany, the Netherlands and France make low (UK) to very low (Belgium) transport tariffs still constitute a competitive disadvantage as they become higher
- *"Taxes, levies and certificates schemes"* are characterised by a large variance. For profile E4, the only regions/countries showing a significant increase compared to 2018 for this component are the Brussels-Capital Region as well as the United Kingdom (increased cost of Renewable Obligation Certificates). The Netherlands clearly shows the lowest level of taxes, even for non-electro-intensive consumers, while in France and Germany competitiveness entirely depends on the electro-intensity of the individual consumer. In this respect, paying the high end of the German tax range can mean more than doubling the total electricity cost of a low-end scenario.



Impact of supercap on industrial consumers in Flanders

To limit the impact of the cost of green certificates on large industrial consumers, Flanders introduced in 2018 a supercap on the cost of financing of renewable energies. The exercise below attempts to illustrate the potential impact of the supercap on industrial consumers in Flanders.

The supercap applies as follow:

- <u>**Case 1**</u>: for undertakings belonging to sectors listed in annex 3 or 5 of the EEAG with an electro-intensity above 20%, the amount due for the costs related to the financing of renewable energy is capped at 0,5% of the average gross value added (GVA) over the last 3 years;
- <u>Case 2:</u> for undertakings belonging to sectors listed in annex 3 of the EEAG, the amount due for the costs related to the financing of renewable energy is capped at 4% of average gross value added over the last 3 years.

The supercap financial impact differs from one company to another as it is based on its last 3 years average gross value added. Therefore, this analysis focuses on identifying the maximum gross value added from which each Profile (E1 to E4) company does no longer benefit from the supercap (i.e. a reduction in the total cost of green certificates).

Indeed, the cost of the green certificate scheme is easily computed by multiplying the average yearly consumption by the average market price of the certificates weighted by the quota (21,5% for Flanders in 2019) and the applicable reduction (47% from 1 to 20 GWh, 80% from 20 to 250 GWh and 98% above 250 GWh). For Profile E1, this green certificate total cost amounts to 111.960 EUR, 234.203 EUR for Profile E2, 525.260 EUR for Profile E3 and 1.204.391 EUR for Profile E4.

Based on the data, the maximum gross value added for a company to benefit from the supercap was computed. The results are synthetized in the following table.

	Case 1	Case 2
NACE codes	Annex 3 or 5 EEAG	Annex 3 EEAG
Electro-intensity	> 20%	No threshold
Supercap (% of GVA)	0,5%	4%

Profile E1			
Average yearly consumption	10 G	Wh	
Scheme cost (without supercap)	111.960 EUR		
Maximum gross value added to benefit from the supercap	22,3 MEUR	2,8 MEUR	



	Profile E2		
Average yearly consumption	25 G	Wh	
Scheme cost (without supercap)	234.203 EUR		
Maximum gross value added to benefit from the supercap	46,4 MEUR	5,86 MEUR	
	Profile E3		
Average yearly consumption	100 (SWh	
Scheme cost (without supercap)	525.260 EUR		
Maximum gross value added to benefit from the supercap	105,1 MEUR	13,1 MEUR	
	Profile E4		
Average yearly consumption	500 (GWh	
Scheme cost (without supercap)	1.204.391 EUR		
Maximum gross value added to benefit from the	240,9 MEUR	30,1 MEUR	

<u>Profile E1</u>

Following this methodology and considering only Profile E1 companies with NACE codes from Annex 3 or 5 from the EEAG (case 1 presented in the table) and with an electro-intensity above 20%, a company will benefit from the application of the supercap as long as its gross value added is less than 22.392.000 euros.



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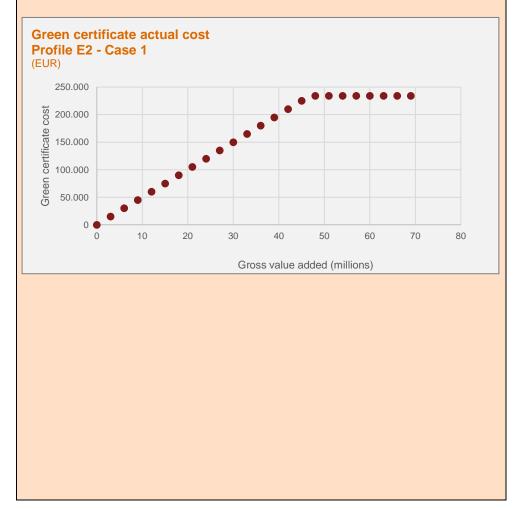


As for Profile E1 companies with NACE codes from Annex 3 of the EEAG (case 2 presented in the table), a company will benefit from the application of the supercap as long as its gross value added is less than 2.799.000 euros



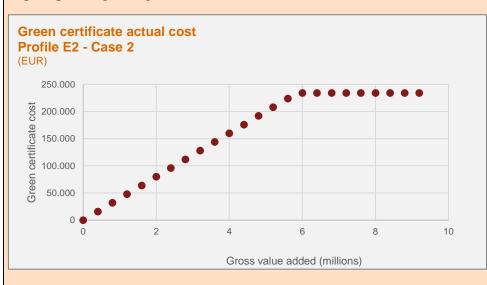
<u>Profile E2</u>

NACE codes from Annex 3 or 5 from the EEAG (case 1 presented in the table) and with an electro-intensity above 20%, a company will benefit from the application of the supercap as long as its gross value added is less than 46.840.600 euros.



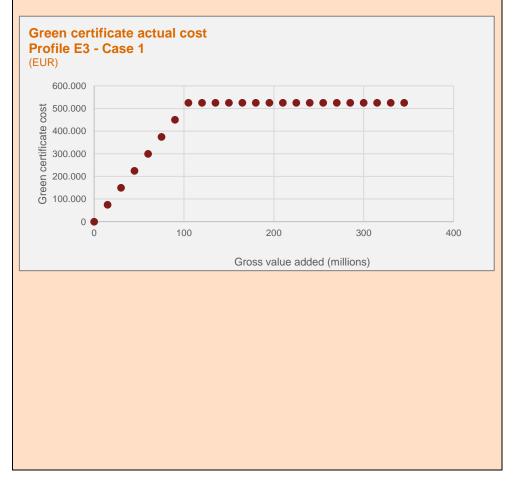


As for Profile E2 companies with NACE codes from Annex 3 of the EEAG (case 2 presented in the table), a company will benefit from the application of the supercap as long as its gross value added is less than 5.855.075 euros.



<u>Profile E3</u>

Following this methodology and considering only Profile E3 companies with NACE codes from Annex 3 or 5 from the EEAG (case 1 presented in the table) and with an electro-intensity above 20%, a company will benefit from the application of the supercap as long as its gross value added is less than 105.052.000 euros.



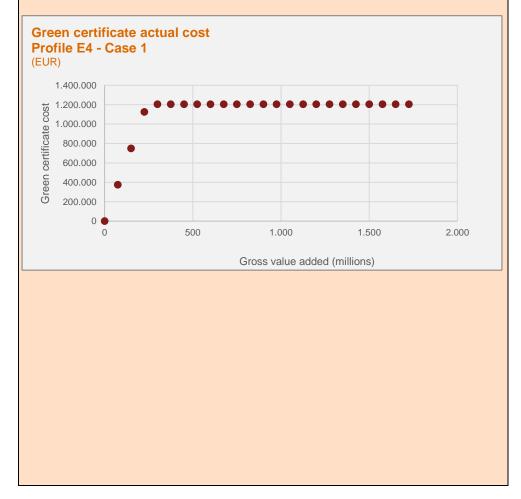


As for Profile E3 companies with NACE codes from Annex 3 of the EEAG (case 2 presented in the table), a company will benefit from the application of the supercap as long as its gross value added is less than 13.131.500 euros.



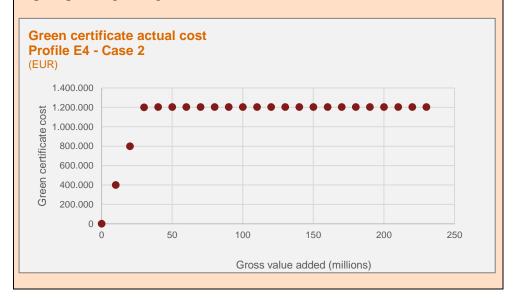
<u>Profile E4</u>

Following this methodology and considering only Profile E4 companies with NACE codes from Annex 3 or 5 from the EEAG (case 1 presented in the table) and with an electro-intensity above 20%, a company will benefit from the application of the supercap as long as its gross value added is less than 240.878.200 euros.





As for Profile E4 companies with NACE codes from Annex 3 of the EEAG (case 2 presented in the table), a company will benefit from the application of the supercap as long as its gross value added is less than 30.109.775 euros.





6.6 Interpretation of figures (Gas)

Figure A: Total yearly invoice

	Symbol	Legend	Interpretation
Graph 1 Total yearly invoice (€/year)	2,793	Maximum option Minimum option	Demonstrates the range of points between the minimum and the maximum option (with regards to taxes and levies) regarding the national criteria
	2,519	Single result	No range is presented (only one level of taxes)

Figure B: Total yearly invoice comparison (Belgium 2019 = 100)

	Symbol	Legend	Interpretation
Graph 1 Yearly invoice comparison (Belgium 2019 = 100)	120	Maximum option Minimum option	Demonstrates the range of points between the minimum and the maximum option (with regards to taxes and levies), if applicable.
	104	Single result	No range is presented (only one level of taxes)

Figure C: Average gas price by component / MWh

	Symbol	Legend	Interpretation
Graph 3 Average power price by component (€/MWh)	21.9	Commodity	Represents the total commodity cost
	2.9	Network	Represents the total network cost
	15.6	Taxes/Levies	Represents the cost of taxes and levies
	<i></i>	Taxes/Levies - minimum	Represents the minimum cost of taxes and levies
		Taxes/Levies - maximum	Representsthepossiblerangebetweenminimumandmaximumcost of taxes and levies



6.7 Profile G1 (Gas)

Total invoice analysis

The analysis of the two gas consumption profiles is carried out along the same methodology as the one used for the electricity profiles. However, while the three Belgian regions are still considered separately in the gas comparison, results are now averaged in the case of Germany and in France (due to the merger of the market areas in November 2018). The Netherlands and the UK are each considered as one single zone. Furthermore, the same methodology as the one used for 2018 was replicated for 2016 and 2017, which explains the differences in commodity prices presented in the 2017 report as the commodity prices of 2016 and 2017 were recalculated. Figure 13 depicts the total yearly invoice charged to the consumer characterised by the reference profile G1. As a reminder, for this profile we exclude the possibility that G1 uses gas as a raw material in the industrial process.



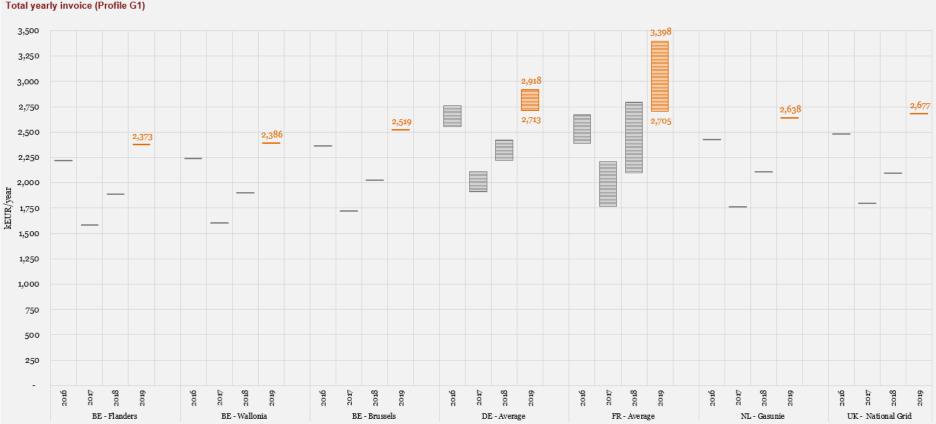
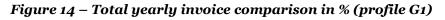


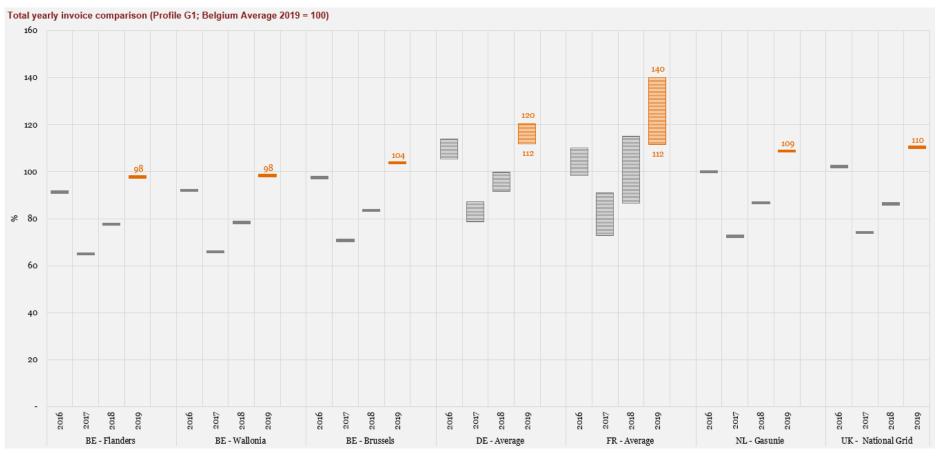
Figure 13 – Total yearly invoice in $k \in /year$ (profile G1)

Total yearly invoice (Profile G1)

For an extensive legend for all figures, see section 6.6.

For the purpose of facilitating the comparisons, in Figure 14 the same results are compared to the reference situation which relates to the average of the three Belgian regions (Belgian average 2019 = 100%).





For an extensive legend for all figures, see section 6.6.

In terms of natural gas for a relatively large industrial consumer like profile G1, we observe a general price increase compared to 2018 that applies to all countries.

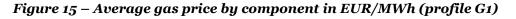
Belgium as a whole offers the most competitive prices of the entire sample, as was the case in 2018. All three Belgian regions are more competitive than all other regions under review, with Flanders and Wallonia offering lower prices than Brussels. Industrial consumers like profile G1 (and which do not use gas as a raw material) in Germany, France, the Netherlands and the UK pay at least 5% to 14% more than similar consumers in Belgium (and potentially up to 40% compared to the Belgian average).

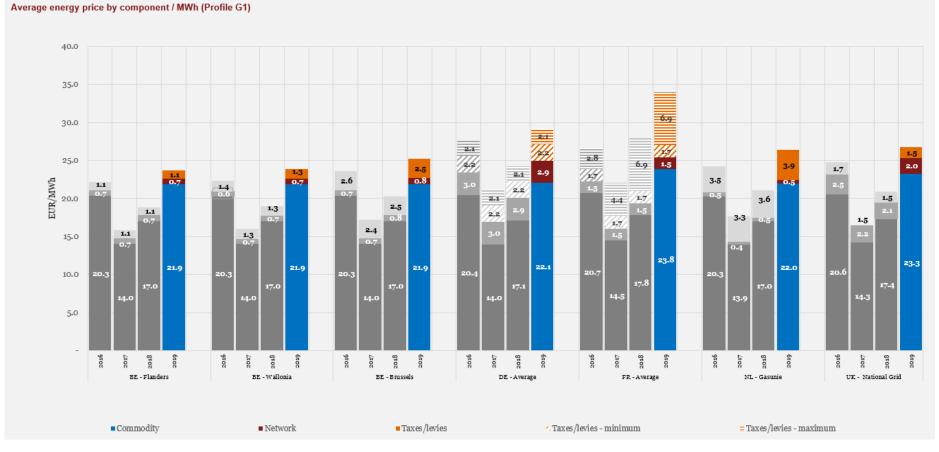
We equally observe that in all cases, total cost for natural gas in Germany and France is higher than that in the UK and the Netherlands.



Breakdown by component

The previous results are further detailed for profile G1 in the following chart, Figure 15, which provides a closer look on the components' breakdown.





For an extensive legend for all figures, see section 6.6.



More than for electricity and in all countries, the **commodity cost** plays the major role in the composition of the total gas price. Market prices in all countries under review converge at a level of about 5 to 6 C/MWh above the January 2018 level. Similarly to last year, the lowest commodity cost is encountered in Belgium. The Netherlands and Germany follow closely whereas France and the UK are the two most expensive countries commodity-wise. Overall, commodity cost has risen in all countries under scrutiny in 2019.

The impact of the other two components is considerably lower. In terms of **network cost** (as a reminder, these are transport and distribution tariffs combined for this profile, except for the Netherlands), we observe two different groups of countries: Belgium and the Netherlands have similar, low tariffs, while in Germany, the UK and France network cost lies considerably higher. Compared to 2018, the only notable evolution is a slightly downward trend in the UK.

As far as **taxes and levies** are concerned, the tax levels in the Flemish and Walloon regions are the lowest of the entire sample. Despite the volume related reductions applicable in the Netherlands, this country offers among the highest cost for this component. In Germany and France, exemptions and reductions based on economic criteria (such as participation in a carbon market in France, or a threshold in terms of pension contributions) create a mixed picture. In case consumers do not qualify for these reductions and exemptions, Germany and especially France offer the highest possible tax rates. As previously stated, possible tax exemptions for natural gas consumers that use gas as a raw material are <u>not</u> taken into account for profile G1.

KEY FINDINGS

The first gas profile (G1) analysis leads to the following findings:

- Belgium is the most competitive country for the total invoice of natural gas prices for relatively large industrial consumers.
- Together with the important share of commodity cost in the total cost, price convergence on the commodity market in the UK, France (where Southern France benefits from the unique market area¹²²), Germany and the Netherlands makes for relatively small differences between the countries/regions under review. For this specific period (all monthly prices observed during the previous calendar year) commodity cost in Belgium, the Netherlands and Germany are "pink flamingos", that is, they are almost identical.
- The impact of network costs and taxes and levies on the total cost is very limited in absolute numbers, but determines the positioning of a country and a consumer in terms of competitiveness.

¹²² Northern (PEG) and Southern zones (TRS) in France merged in November 2018. Prior to the merger, prices merger were significantly higher in the Southern zone whereas prices in the Northern zone were close to those in Belgium, the Netherlands and Germany. Unified French prices are similar to those in the Belgian, Dutch and German zones. We can therefore conclude that Southern France benefited from this merger without having a negative influence for Northern France. In the scope of this study, all monthly commodity prices observed during the previous calendar year for natural gas were taken into account. Results demonstrates for this period that France shows a mix of high prices and low prices respectively in the Southern zone and in the Northern zone. If prices from January 2019 had been used as a reference for the study, commodity price for France would have been similar to that of Belgium, the Netherlands and Germany



6.8 Profile G2 (Gas)

Total invoice analysis

The next chart, Figure 16, depicts the total yearly invoice charged to the consumer characterised by the reference profile G2. As a reminder, we assume profile G2 can be a feedstock consumer using natural gas as a raw material in the industrial process (bottom range) but we also depict the possibility that he is not such a consumer (top range).

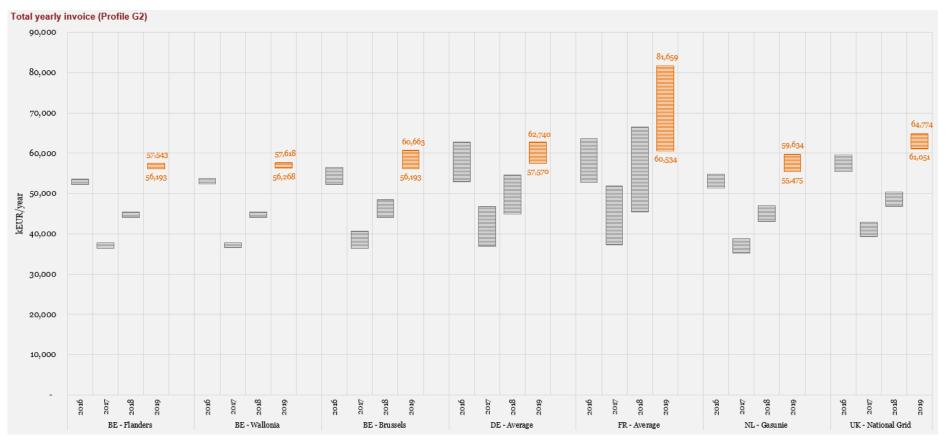


Figure 16 – Total yearly invoice in $k \in /year$ (profile G2)

For an extensive legend for all figures, see section 6.6.

For the purpose of facilitating the comparisons, in Figure 17, the same results are compared to the reference situation which relates to the average of the three Belgian regions (Belgian average 2019 = 100%).

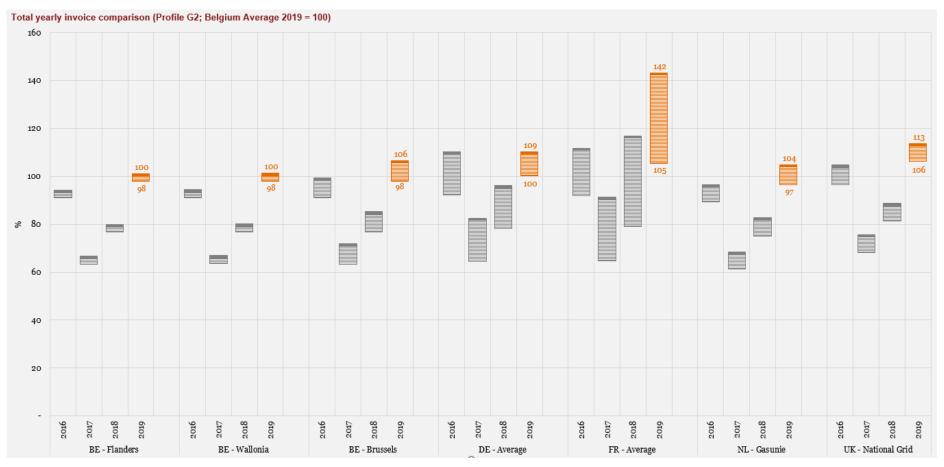


Figure 17 – Total yearly invoice comparison in % (profile G2)

For an extensive legend for all figures, see section 6.6.

In terms of natural gas for very large industrial consumers (profile G2), Belgium generally offers very competitive prices. For very large industrial feedstock consumers using natural gas as a raw material (bottom range of the figures), cost differences between the countries under review are relatively small, except for



the UK and France¹²³ that offer a substantially higher cost. For these consumers, the Netherlands is the most competitive countries under review, followed very closely by Belgium.

For very large industrial consumers that do not use natural gas as a raw material, but rather for heating and other purposes (top range of the figures), cost differences between the countries under review are much more important. Belgium is generally very well positioned, joined by the Netherlands and Germany. Consumers in the UK and France can pay up from 5% to 42% more than comparable consumers in Belgium.

Breakdown by component

The previous results are further detailed for the profile G2 in the following chart,

Figure 18, which provides a closer look on the components' breakdown.

¹²³ While former reports used to highlight substantial differences in price between regions within France, this report presents France as one. Therefore, France as a whole shows less competitive results than Northern France did in previous reports. The higher commodity cost for France is explained by the average of Southern and Northern France during the first ten months of 2018. After the merger in November 2018, the commodity cost in France are similar to that of Belgium, The Netherlands and Germany.

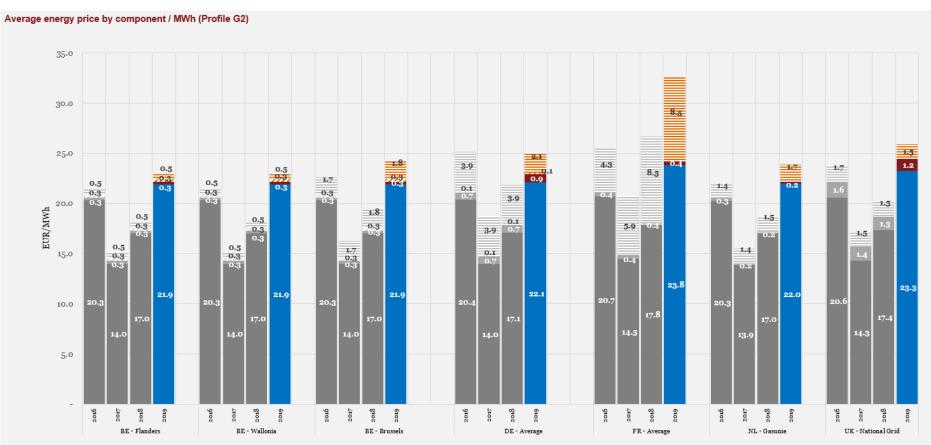


Figure 18 – Average gas price by component in EUR/MWh (profile G2)

For an extensive legend for all figures, see section 6.6.



As it is the case for profile G1, the **commodity cost** is by far the largest part of the total gas price for profile G2. Market prices in all countries under review converge at a level about 5 to 6 €/MWh above the January 2018 level. Similarly to last year, the lowest commodity cost is encountered in Belgium. The Netherlands and Germany follow closely whereas France¹²⁴ and the UK are the two most expensive countries commodity-wise. Overall, commodity cost has risen in all countries under scrutiny in 2019.

Network costs only make up for a limited amount of the total cost and show very little evolution compared to 2018. We observe the lowest values in Netherlands followed by Belgium and France (both TSO), and slightly higher values in Germany. Tariffs in the UK are markedly higher than in the other countries under review.

As far as **taxes and levies** are concerned, all countries under review give exemptions for large baseload industrial consumers. All volume based exemptions have already been taken into account in the maximum option in

Figure 18. For these top range results, which only apply to consumers that do not use gas as raw material, we observe the highest tax levels in France and Germany, and the lowest in the Flemish and Walloon regions. On the contrary, consumers using gas as raw material in France and the Netherlands are charged such a minimal tax fee that it is close to null.

For consumers that use natural gas as a raw material (feedstock), all countries under review apply important tax exemptions on top of some existing volume reductions. This is the case for Belgium (energy contribution), Germany (Energiesteuer), France (TICGN), Netherlands (Energiebelasting) and the UK (Climate Change Levy). The general level of taxes and levies for these feedstock consumers, reflected by the minimum option in

Figure 18, is hence very low for all regions under review¹²⁵. Nevertheless, Belgium offers the highest level of taxes for these feedstock consumers, because no exemption exists on the federal contribution, although capping and digressiveness apply.

¹²⁴ This is due to the situation before the merger of the Southern and Northern zones in November 2018.

¹²⁵ With the exception of the hypothetical Brussels case (see Footnote89).



KEY FINDINGS

The very large industrial gas consumer profile (G2) analysis leads to the following findings:

- Belgium is generally very competitive for the total invoice of natural gas prices for very large industrial consumers of natural gas. For consumers using gas as raw material, the Netherlands offers a lower total cost than Belgium.
- While commodity costs rose in all countries, Belgium still shows lowest commodity cost like the previous year. Together with the important share of commodity cost in the total cost, price convergence on the commodity market in the UK, France¹²⁶, Germany and the Netherlands makes for relatively small differences between the countries/regions under review.
- Even though the impact of network costs is rather limited in absolute numbers, it is important in determining the positioning of a country and a consumer in terms of competitiveness. Network costs for clients directly connected to the transport grid are the lowest in the Netherlands, and the highest in Germany and the UK.
- When considering taxes and levies without taking into account the exemptions for feedstock consumers, Belgium is the country with the lowest cost for this component. France and also Germany clearly offer the highest potential cost.
- When considering taxes and levies after taking into account the exemptions for feedstock consumers and the other applicable reductions, taxes and levies are almost negligible in most countries. Although the cost of this component is relatively low when compared to the total cost, Belgium is the country with the highest cost for this component.

¹²⁶ The price convergence for France as a whole only refers to the period after the merger of the Southern and Northern zones in November 2018.

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7. Energy prices: Conclusions



7.Energy prices: conclusions

7.1 Electricity

Some **general conclusions** can be drawn in terms of electricity prices:

- In every country, governments intervene in order to reduce the electricity cost for some categories of large industrial consumers. These interventions mainly occur on two components: transport (Germany, France and the Netherlands) and most importantly taxes, levies and certificate schemes (Belgium, UK, Germany, France and the Netherlands). The increase in market prices led to a French intervention on commodity prices (ARENH¹²⁷) as opposed to 2018.
- 2. Commodity cost plays a very important role: in 2019 a general increase in commodity prices for all countries was noticed, Belgian commodity prices are now back in line with Dutch commodity prices whereas the gap has widened with France. German commodity prices remain well below the prices in other countries.
- 3. In terms of overall competitiveness, all countries under review (except the UK) can offer lower total prices than the three Belgian regions for the four consumer profiles, but in the case of Germany and France this is only true for (sometimes very) electro-intensive consumers. Prices in Belgium for very large baseload consumers (profile E4) are comparatively more competitive than for smaller consumers (profile E1). In other words, the higher the electricity consumption is for a company in Belgium, the more competitive the prices practiced on the Belgian market are.
- 4. The United Kingdom remains an outlier on the high side for total electricity prices for all profiles under review. This is partly but not entirely explained by significantly higher commodity prices, and to a lesser extent by network costs and taxes, levies and certificate schemes.

7.2 Gas

As far as natural gas is concerned, some **general conclusions** can also be drawn:

- 1. Commodity costs represent the major part of the gas bill, and their relative importance is higher than for electricity.
- 2. Prices on the commodity market in Belgium, the UK, France, Germany and the Netherlands makes for relatively small differences between the countries/regions under review although prices in France and the UK tend to diverge for this year. For this specific period (average of all 2018 months) commodity costs in Belgium were the lowest observed amongst the countries under review. Differences in commodity prices are in any case not as significant compared to electricity.
- 3. For industrial consumers not using gas as a raw material, whether they are large or very large consumers, the Flemish and Walloon regions offer the most competitive total prices. For very large feedstock consumers using gas as a raw material, Belgian gas consumers in 2019 have no clear competitive advantage over their competitors in neighbouring countries. The Netherlands are offering a lower price. This evolution is caused by the fact that Belgium is the only country of those under review not exempting feedstock consumers from all taxes (federal contribution). For both consumer profiles, the competitive position of Belgium is based on a

¹²⁷ L'Accès Régulé à l'Électricité Nucléaire Historique.



competitive commodity cost, low network costs, and a comparatively low level of taxes and levies.

7.3 Competitiveness score

To interpret the **Belgian situation** in terms of energy cost for industry, we present a competitiveness scorecard that does an effort to summarize the complex and nuanced situation that we have described throughout this report. We address the question whether, based on the consumer profiles provided by the CREG and on the assumptions that we set out earlier on, the energy cost for industrial consumers in Belgium/Flanders/Wallonia/Brussels is competitive when compared to the neighbouring countries (and the price zones within those countries)¹²⁸. In section 8.1 of this report, this analysis will be elaborated based on macro-economic data.

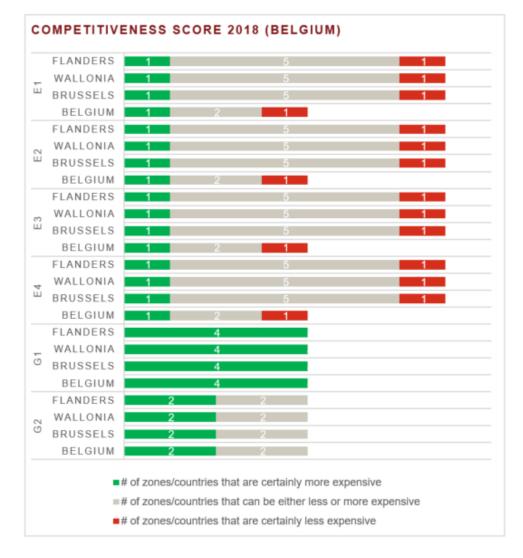
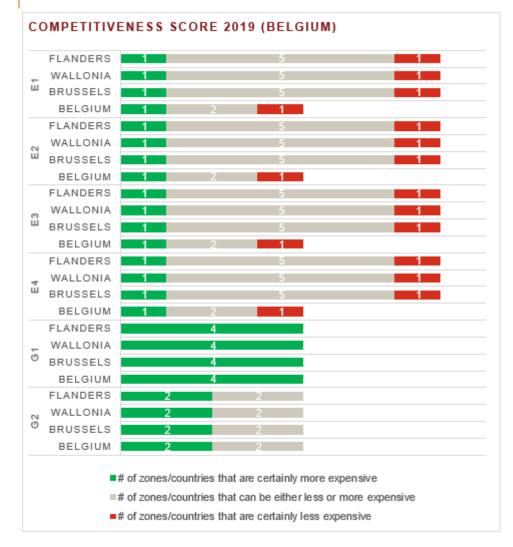


Figure 19 – Competitiveness scorecard

¹²⁸ It has to be noted that the merger of market areas in France impacts the number of zones to which regions of Belgium are compared in terms of competitiveness. Yet, the comparison over one year to the other can be done based on the proportion of zones certainly/either more/less expensive.

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For electricity, there is no visible evolution compared to 2018.

The situation observed in January 2019 is not different from the one observed last year; only one neighbouring country - the United Kingdom – is less competitive than Belgium, for all electricity consumption profiles. Similarly, for all consumption profiles and in all cases, the Netherlands is more competitive than Belgium.

The grey zone represents the complexity of electricity cost for industrial consumers. In Germany and France, for instance, consumers that do not qualify for electrointensity criteria are paying more than their Belgian counterparts. However, for electro-intensive consumers benefiting from the existing reductions and exemptions, Germany, France and the Netherlands offer electricity costs that are consistently 15 to 40% lower than in Belgium. Similar reductions have been introduced in Flanders for the first time in 2018.

The differences between the Flemish and Walloon regions are more important for profiles E1 and E2 where electricity cost observed in the Walloon region is about 8% higher than the one observed in the Flemish region. For profiles E3 and E4, the picture is much more nuanced, with relatively small differences between both regions and with the Walloon region being more competitive for E3 (2% difference) and E4 (<1% difference) for non-electro-intensive industrial consumers. Otherwise, Flanders is offers more competitive prices for electro-intensive industrial consumers than Wallonia for profiles E3 (-6%) and E4 (-4%).

In terms of industrial gas consumers, the situation depicted by the competitiveness scorecard is not different from the one for electricity even if the



basis for comparison changed as France merged into one unique market area¹²⁹. For profile G1, the situation did not change in comparison with 2018 as Belgium remains more competitive than all other countries. For profile G2, the situation did not change either as two zones/countries being still either less or more expensive. When considering top range prices (no feedstock consumers), the situation is similar to G1, with the Belgian regions more competitive than the other countries/regions. For feedstock consumers (bottom range prices) the competitive position remained stable in comparison with 2018 as the Netherlands is the unique country that can offer lower prices than Belgium. The grey zones in the competitiveness scorecard reflect this uncertainty linked to possible reductions that can be obtained based on economic parameters (feedstock activity or not).

The competitiveness scorecard in Figure 19 is a good attempt to summarize the general picture in terms of competitiveness of electricity and gas prices in Belgium and its regions compared to its neighbouring countries, but it hides some of its complexity regarding the competitiveness of electricity prices. As it was shown in section 6 of this report, some industrial consumers in the neighbouring countries benefit from considerably lower prices because of reductions based on electro-intensity criteria. This is not the case in Belgium, where reductions are only based on offtake.

Therefore, it is appropriate to present a competitiveness scorecard comparing electricity and gas prices in Belgium and its regions with those consumers which benefit from reductions (electro-intensive consumers) and those which do not (nonelectro-intensive consumers) in the neighbouring countries. Those comparisons are presented in Figure 20 and Figure 21 respectively.

 $^{^{129}}$ In order to be able to compare, results from 2018 were adapted and an average price for all former three regions from France was computed.

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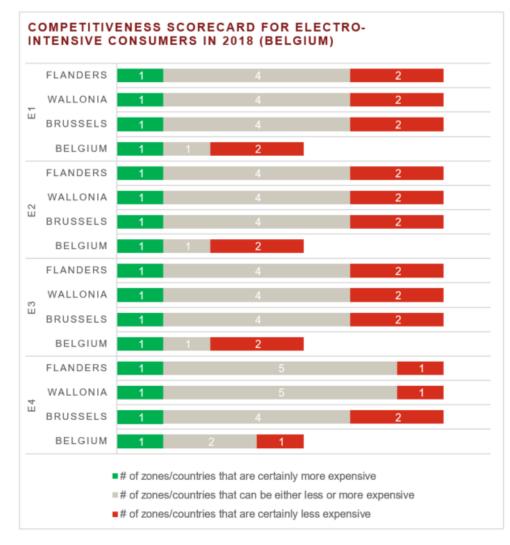


Figure 20 – Competitiveness scorecard for electro-intensive consumers

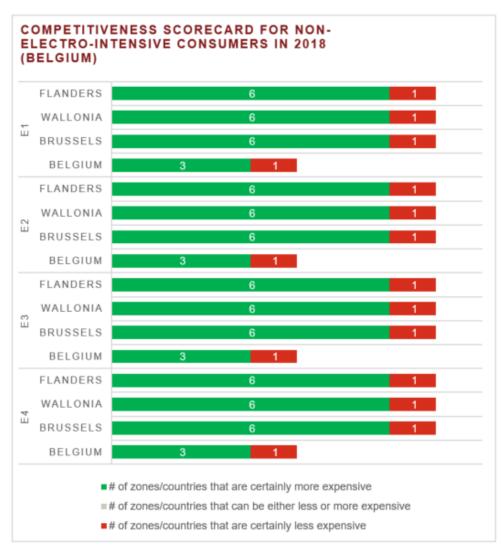




When comparing Belgian prices for electro-intensive consumers with those from the neighbouring countries, only one neighbouring country is certainly less competitive than Belgium: the United Kingdom. Similarly, for all consumption profiles and in all cases, the Netherlands and France are more competitive than Belgium, except in the case of E4 for Flanders. The grey zone can almost entirely be attributed to Germany and represents the complexity of reduction schemes.

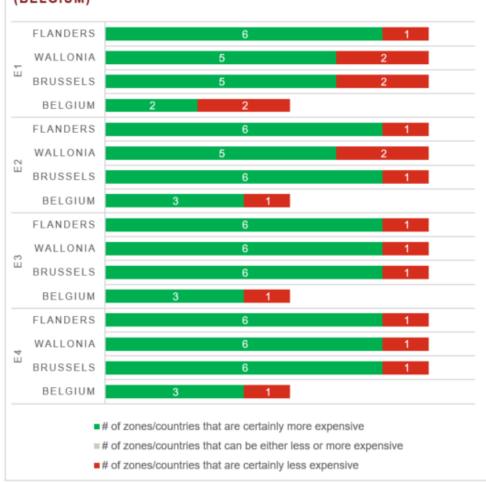


Figure 21 – Competitiveness scorecard for non-electro-intensive consumers





COMPETITIVENESS SCORECARD FOR NON-ELECTRO-INTENSIVE CONSUMERS IN 2019 (BELGIUM)



When comparing prices in Belgium and its regions for non-electro-intensive consumers with those from the neighbouring countries, a completely different competitiveness scorecard can be observed. As depicted in Figure 21, it is clear that the picture for Belgium and its regions looks much more positive. The Netherlands offers lower total prices for all electricity consumer profiles, but all other countries offer clearly higher electricity prices for these consumers which are not benefiting from any electro-intensity-based reductions. The main evolution from 2018 to 2019 can be seen for profile E1, where prices in the Walloon and the Brussels region slightly increased leading to a lesser competitive position. The same observation applies to the Walloon region for profile E2.

7.4 Tax burden for electricity consumers

When analysing and summarising the results in terms of electricity, it is interesting to see how the third component (taxes, levies and certificate schemes) compares between the different consumer profiles. In Figure 22, the orange bars represent the total cost per MWh of component 3: taxes, levies and certificate schemes. The full yellow bars represent the minimum- maximum ranges where different options are possible, while the transparent yellow bars represent the maximum range for non-electro-intensive consumers in Germany, France and the Netherlands. The red lines represent the weighted average tax burden of the four consumer profiles for a certain country (in C/MWh) (for electro-intensive ranges in UK, FR and NL).

Tax burden (EUR/MWh) 90 80 60 E1 E1 E2 E3 E4 E1 E4 Eı E3 E4 E2 E3 Eı Eı E2 E3 E4 Eı E3 E2 Eз E2 E4 E2 E3 E4 E2 E4 Wallonia Flanders Braceole Germany (average) France The Netherlands The United Kingdom

Figure 22 – Taxes, levies and certificate schemes throughout 4 profiles

There is no difference compared to 2018, each of the Belgian regions allocate the total burden of extra costs (simplified: tax burden) differently, but one common trend is clearly visible: the more one consumes, the lower the tax burden is. In contrast, the UK grants no reductions based on volume and allocates the tax burden completely evenly over the four profiles.

Nevertheless, we also observe that the majority of the other countries under review (Germany, the Netherlands, France) have shifted (and this shift happened in 2016 already, but is confirmed in 2017, 2018 and 2019) towards electro-intensity criteria regarding the allocation of the tax burden, while two out of three Belgian (Wallonia and Brussels) regions still defines exemptions strictly based on offtake, even on regional surcharges. The Flemish region was the first Belgian region to introduce reductions based on electro-intensity in 2018 (cap and super cap on green certificate quota). Indeed, in Germany, France and the Netherlands (and since 2018 also Flanders), we observe large possible differences within one single consumer profile depending on the economic profile and the electro-intensity of the consumer. In the Walloon and Brussels-Capital regions, on the other hand, we observe important differences in offtake level and grid connection level (apart from some general sector conditions).

In other words, from a fiscal point of view, we can see an important evolution since 2017. Belgian federal and regional authorities mainly grant reductions and/or exemptions to taxes, levies and certificate schemes based on the level of electricity offtake, and not on the level of electro-intensity of an industrial consumer, except in Flanders, where the so-called cap and super cap were introduced for the green certificate cost of electro-intensive consumers. In the case of Wallonia and Brussels, but also for federal taxes, this could possibly mean that tax revenues are directed toward protecting consumers that are not particularly affected by a lack of competitiveness of electricity prices, while more vulnerable consumers keep suffering from an important disadvantage compared to their electro-intensive competitors in neighbouring countries.

7.5 Impact of reductions on network costs

As briefly stated in the previous sections, the impact of reductions on network costs for large baseload consumers such as profiles E3 and E4 are important. Germany introduced these reductions in 2012, the Netherlands in January 2014 and France¹³⁰

¹³⁰ In France, a new and relatively complex transmission tariff reduction was introduced. Figures 23 and 24 therefore present the minimum (vertical bars) and maximum (horizontal) of the reduced transmission tariff for E3 and E4 in France.



reintroduced them in January 2017. Belgium and the UK do not grant such reductions.

In Germany, France and the Netherlands, large baseload consumers such as E3 and E4 in this study can benefit from a transport tariff reduction up to 90%. As shown in Figure 23 and Figure 24 here after, these reductions profoundly alter the situation in terms of transmission tariffs for profile E3 and even more for profile E4, and by doing so the general picture in terms of competitiveness.

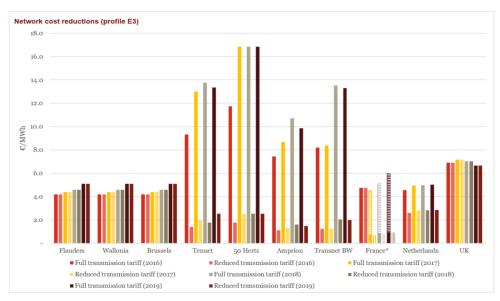


Figure 23 – Network cost reductions (profile E3)

*Minimum and maximum of the reduced transmission tariff for E3 in France, Source: PwC

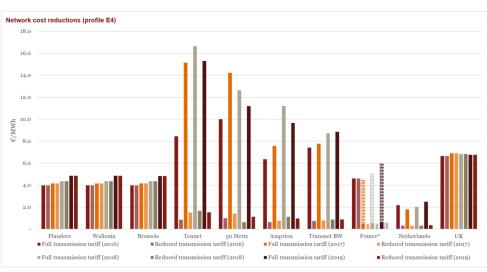


Figure 24 – Network cost reductions (profile E4)

*Minimum and maximum of the reduced transmission tariff for E4 in France, Source: PwC

In all cases, the cost is transferred to the other consumers. In the Netherlands and France, these reductions are compensated by the transport tariff itself (through regulatory accounts, for instance). In Germany, a separate levy (the "StromNEV §19-Umlage") was created to pay for the reduction. It is due by all consumers, but yet again reductions for large consumer profiles are granted on this levy. We can therefore state that high transmission tariffs in Germany are not the consequence of the reductions, but rather the cause.



Similarly to 2018, the differences between West and South West (Amprion and Transnet BW) and North and North East Germany (TenneT and 50 Hertz) have further declined. Nevertheless, for the fourth year in a row, network cost in TenneT and 50 Hertz territory is higher than in Amprion and Transnet BW territory. The tariff reductions for baseload consumers in Germany do not only serve to protect competitiveness compared to neighbouring countries, but also to even out intra-German differences observed between the different geographical zones.

Secondly, we can see that – as the first country in the five countries under review – **France has introduced the notion of electro-intensity** in the criteria for tariff reductions since 2017. All baseload or anti-cyclical consumers that meet the criteria (very similar to other countries) receive tariff reductions, but the height of these reductions varies in function of the electro-intensity level of the individual consumer¹³¹. This further enhances the gap between prices for electro-intensive and non-electro-intensive consumers in France. None of the other countries under comparison has followed France down this road in 2019 (so far).

 $^{^{\}scriptscriptstyle 131}$ $\,$ The system is explained in detail on page 45 and following.

8. Competitiveness of the Belgian industry in terms of energy and recommendations



8. Competitiveness of the Belgian industry in terms of energy and recommendations

8.1 Competitiveness analysis

Methodology

In the 2016 report, the top 5 most important industrial sectors in Belgium (in the framework of an energy price comparison) were selected: the chemical (NACE 20), basic metal (NACE 24), pharmaceutical (NACE 21), food & beverages (NACE 10-12) and non-metallic mineral (NACE 23) industries.¹³² Based upon the selection of those sectors, four relevant electricity and two relevant gas profiles for industrial consumers in Belgium and its regions were presented. In the previous chapters of this report, the gas and electricity prices were compared with those of Belgium's neighbouring countries: Germany, France, the Netherlands and the UK.

In this final chapter the information gathered in the previous chapters is combined to analyse the competitiveness of the top 5 most important sectors in Belgium and its regions. The line of reasoning on which the competitiveness analysis is based, is presented in Figure 25.

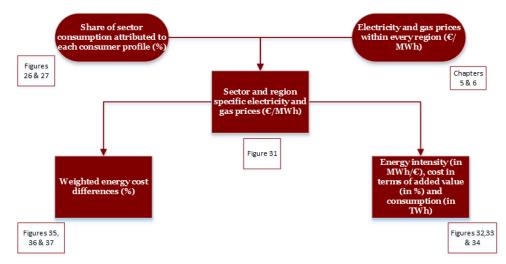


Figure 25 – Methodology flowchart

As it is observed from the flowchart, in a first step the electricity and gas prices in Flanders, Wallonia and Brussels (see sections 6 and 7) are combined with the distribution of the different consumer profiles over the CREG-sample of invoicing data over the top 5 sectors, resulting in **sector- and region-specific electricity and gas prices**. In a second step, these prices are used to calculate two important variables, through two separate pathways. The first pathway calculates a **weighted energy cost difference**, which combines electricity and gas prices in one single measure that makes it possible to compare energy prices of a certain sector (within a certain region) with that of the European average, while the second pathway

¹³² In this section we will use this order to present the results. It resembles the order of the importance of the sectors.



elaborates on the **energy intensity**, which expresses the energy (electricity and gas) cost of a certain sector and region in terms of added value.

This chapter is organised around this flowchart, which will be explained and discussed in detail in the following sections.

Sector and region specific electricity and gas prices

In the previous chapters, the electricity and gas prices for each of the three regions in Belgium were gathered. As the objective in this chapter is to analyse the competitiveness of these prices for the top 5 most important sectors, developing a method that uses these regional prices and expresses them on a sector level is needed. This is done by combining the regional electricity and gas prices with the distribution of consumer profiles per sector (see Table 2 and Table 3), which were retrieved in the 2016 report. They are based on data provided by the CREG and show how consumer profiles are distributed per sector, which consumer profile is the most predominant within each sector and therefore has the largest impact on the electricity and gas prices for that sector.

The relative frequency of each consumer profile per sector (retrieved by multiplying the absolute number of profiles with the consumption of each profile¹³³¹³⁴and dividing by the total consumption per sector¹³⁵) are presented in the tables below. As one can see from Table 2, E2 is the predominant profile in the food and beverages sector (NACE 10-12), while it is E3 for the NACE 20, 21 and 23 sectors and E4 in the NACE 24 sector. The prices of those predominant consumer profiles will have the largest effect on the electricity prices for each of the top 5 sectors within each region. From Table 3 it is apparent that in all sectors, profile G1 is the predominant one, except for the NACE 20 sector.

The columns (1) in Table 2 refer to the absolute frequencies, while the columns (2) in the same table refer to the relative frequencies.

¹³³ The data in both Table 2 and Table 3 are based on invoicing data from the CREG for all consumers with an offtake of more than 10 GWh of gas or electricity a year.

¹³⁴ For electricity: 10 GWh for E1, 25 GWh for E2, 100 GWh for E3 and 500 GWh for E4.

¹³⁵ As presented during phase 1 of the 2016 report, based on Federal Planning Bureau data (Energy Consumption accounts), which have not been updated by the Federal Planning Bureau ever since.



Table 2 – Distribution of electric consumer profiles per sector ¹³⁶	

Code NACE-Sector				,5- 62,5 E3 (62, h/yr) GWh/y				>300 1/yr)
NACE-Sector	(1)137	$(2)^{138}$	(1)	(2)	(1)	(2)	(1)	(2)
20 Chemicals and chemical products	20	6%	25	18%	16	47%	2	29%
24 Basic metals and fabricated metal products	10	3%	15	10%	14	36%	4	52%
21 Pharmaceutical products and preparations	1	2%	7	36%	3	62%	-	0%
10-12 Food products, beverages and tobacco products	51	23%	52	59%	4	18%	-	0%
23 Other non-metallic mineral products	11	10%	13	29%	7	62%	-	0%

Table 3 – Distribution of gas consumer profiles per sector¹³⁹

Code NACE-sector		o GWh/year) GWh/year)
20 Chemicals and chemical products	(1) ¹⁴⁰ 71	(2) ¹⁴¹ 36%	(1) 5	(2) 64%
24 Basic metals and fabricated metal products	32	56%	1	44%
21 Pharmaceutical products and preparations	12	100%	-	0%
10-12 Food products, beverages and tobacco products	181	100%	-	0%
23 Other non-metallic mineral products	33	57%	1	43%

As an example, the absolute frequencies for the chemicals and chemical products (NACE 20) sector is 20 or 20 consumers have a quantity of invoiced electricity similar to the consumption of profile E1, 25 consumers for E2, 16 consumers for E3 and 2 consumers for E4. Multiplying these numbers by their respective consumption and summing them, results in a theoretical total electricity consumption on the

¹³⁶ Source: CREG (2014), PwC Calculations

¹³⁷ The figures in column 1 refer to the absolute frequencies of each consumer profile per sector within the respective consumption range. For example, there are 51 cases of consumer profile E1 (with a consumption between 10 and 17,5 GWh/year) within the NACE 10-12 sector.

The figures in column 2 refer to the relative frequencies or the ratio between the total consumption 138 of each consumer profile within a sector (absolute frequency times 10, 25, 100 or 500 GWh) and the consumption of all consumer profiles within that sector (absolute frequency of E1 * 10 GWh + absolute frequency of E2* 25 + ...). Per sector (horizontal summation), the relative frequencies add up to 100%, except for NACE 23 and 24, because they are presented as rounded figures. 139

Source: CREG (2014), PwC Calculations

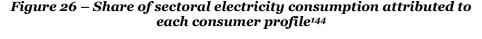
¹⁴⁰ The figures in column 1 refer to the absolute frequencies of each consumer profile per sector within the respective consumption range. For example, there are 71 cases of consumer profile G1 (with a consumption between 10 and 1.000 GWh/year) within the NACE 20 sector.

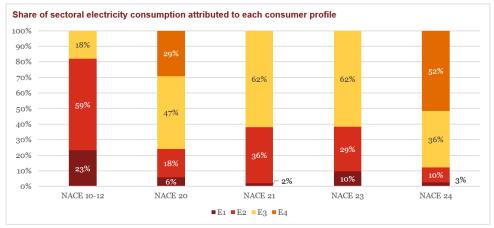
¹⁴¹ The figures in column 2 refer to the relative frequencies or the ratio between the total consumption of each consumer profile within a sector (absolute frequency times 100 or 2.500 GWh) and the total consumption of gas between that sector (absolute frequency of G1 * 100 GWh + absolute frequency of G2 * 2.500 GWh). Per sector (horizontal summation), the relative frequencies add up to 100%.



sector level of 3.425 GWh¹⁴². Expressed in relative frequencies, 6% of the total consumption is represented by profile E1, 18% by E2, 47% by E3 and 29% by E4¹⁴³. For this sector, the prices for E3 will have a predominant effect on the calculation of the weighted electricity price for that sector, as it simply represents the largest share in the total electricity consumption for that sector. For gas, there are 71 consumers of profile G1 and 5 of G2. Multiplying these numbers by their consumption and summing both up, results in a theoretical total consumption for the sector of 19.600 GWh. This reflects a relative frequency of 36% for G1 and 64% for G2.

Along the same logic the relative frequencies of the consumer profiles for the other sectors have been calculated and are presented again in Figure 26 and Figure 27. As it is clear from Figure 26, profile E3 is the predominant profile in most of the sectors (NACE 20, 21 and 23), while for NACE 24 profile E4 is predominant (very large users) and for the food and beverages sector (NACE 10-12) it is profile E2.





From Figure 27 it is observed that for all sectors, except for NACE 20, G1 is the profile with the highest relative frequency. Although there are just a few G2 consumer profiles represented in the different sectors, they can have a substantial relative frequency, caused by their high volume of gas consumption (2.500 GWh). Of course this is not the case for the pharmaceutical (NACE 21) and the food & beverages (NACE 10-12) sectors, as no consumers of G2 are represented within those sectors.

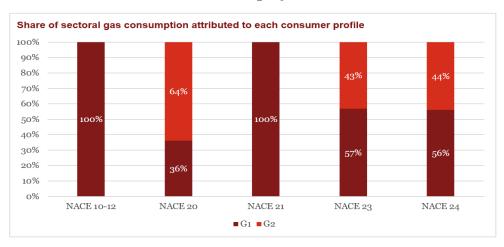
 $^{^{142}}$ Total electricity consumption of 3;425 GWh = (20* 10 GW h) + (25* 25 GWh) + (16* 100 GWh) + (2* 500 GWh).

¹⁴³ Weighted average for E1 of 6% = (20 * 10 GWh) / 3.425 GWh

¹⁴⁴ Source: CREG (2014), PwC Calculations



Figure 27 – Share of sectoral gas consumption attributed to each consumer profile¹⁴⁵



As previously stated, these relative frequencies can be used together with the electricity and gas prices for each region to calculate sector and region specific electricity and gas prices (in C/MWh). This is done by summing the multiplications of the prices retrieved for each consumer profile and their relative frequencies according to the formulas below:

$$P_{elec} \text{ for Sector}_{i} \text{ in Region}_{j}$$

$$= \sum_{X=1}^{4} (Price \text{ for } E_{X} \text{ in Region}_{j} * Relative \text{ frequency of } E_{X} \text{ in Sector}_{i})$$

P_{gas} for Sector_i in Region_i

 $= \sum_{Y=1}^{2} (Price \ for \ G_Y \ in \ Region_j * Relative \ frequency \ of \ G_Y \ in \ Sector_i)$

When comparing those region and sector specific prices to the European average¹⁴⁶ they can be expressed as price differences with the European average. We have calculated the average prices of electricity and gas in the neighbouring countries according to the following formulas¹⁴⁷:

European average of P_{elec} for Sector_i

 $= \sum_{X=1}^{4} (Average \ price \ for \ E_X \ in \ neighbouring \ countries * \ Relative \ frequency \ of \ E_X \ in \ Sector_i \)$

Eureopan average of P_{gas} for Sector_i

 $= \sum_{Y=1}^{2} (Average \ price \ for \ G_Y \ in \ neighbouring \ countries * Relative \ frequency \ of \ G_Y \ in \ Sector_i \)$

The electricity and gas price differences (in %'s) measure the price difference for a certain sector i in a certain region j with the European average. These sector and region specific electricity and gas price differences when compared with the average of Belgium's neighbouring countries can be found below and are presented in Figure **28** (for the electro-intensive consumers), Figure 29 (for non-electro intensive consumers) and Figure 30 for gas consumers.

¹⁴⁵ Source: CREG (2014), PwC Calculations

¹⁴⁶ The European average throughout this section refers to the average of the neighbouring countries under scope in this report: Germany, France, the Netherlands and the United Kingdom.

¹⁴⁷ We have used the same share of sectoral electricity and gas consumption attributed to each consumer profile to calculate the average price of electricity and gas in the neighbouring countries. This way we assume that the different consumer profiles are equally distributed in the sectors under scope of the neighbouring countries.



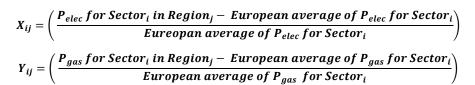


Figure 28 – Electricity price differences for electro-intensive consumers compared with the average in the neighbouring countries¹⁴⁸

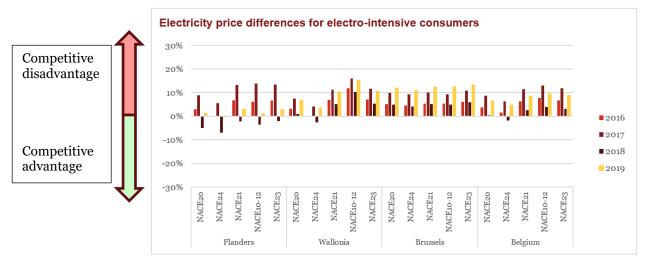
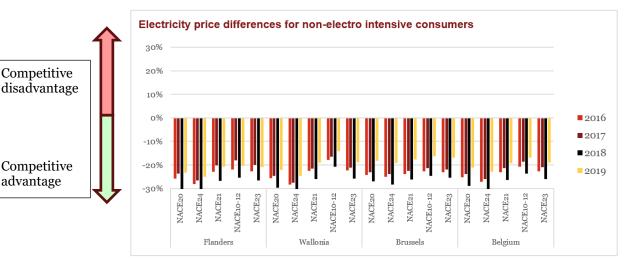


Figure 29 – Electricity price differences for non-electro-intensive consumers in comparison with the average in the neighbouring countries¹⁴⁹



One can observe in Figure 28 and Figure 29 that electricity price differences differ substantially from sector to sector and from region to region, but are almost always higher, when comparing Belgian consumers with companies that are considered electro-intensive consumers in their countries (lack of competitiveness). Compared with last year, the disadvantage has increased substantially, especially for NACE 10-12, 21 and 23 in Brussels and Wallonia, as prices for E3 and E4 increased more in those regions than in the neighbouring countries. Overall, price differences rose in all sectors in Belgium. However, when comparing Belgian consumers with companies that are considered non-electro-intensive consumers in their respective

¹⁴⁸ Source: CREG (2014), PwC Calculations

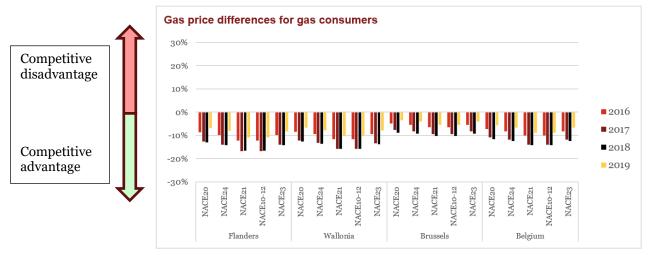
¹⁴⁹ Source: CREG (2014), PwC Calculations

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countries, prices are considerably lower (competitive prices), though in a lesser extent when comparing with last year.

Figure 30 – Gas price differences for gas consumers in comparison with the average in the neighbouring countries



From Figure 30, it can be observed that gas prices – generalized on a sectoral level - are more competitive in Belgium than in the neighbouring countries, for all sectors and in all regions, and so even more for sectors with a heavier part of G1 consumers (for example NACE 10-12). In comparison with 2018, gas prices are less competitive in Belgium though still cheaper. This is due to a larger increase in commodity prices in Belgium than in neighbouring countries (+5.8 €/MWh compared to + 5 €/MWh in the Netherlands and Germany and +4.5 €/MWh in France).

Electro-intensive and non-electro-intensive consumers

It is important to note that in the previous and following sections two different results in terms of energy price differences are presented: one is showing the comparison within electro-intensive consumers and the other is the comparison within non-electro-intensive consumers. The first one, valid for electro-intensive consumers, compares prices for each region in Belgium to the low range of prices observed in the neighbouring countries; assuming that, in each of the neighbouring countries, the 'competitors' of Belgian industrial consumers **qualify for the national electro-intensity criteria and hence benefit from important reductions on several price components for electricity**, as is specified in Table 4.



Country	Criteria
Germany	For consumers of most industrial sectors: when electricity cost >14% of gross added value For consumers of a less extensive list of industrial sectors: when electricity cost >20% of gross added value ¹⁵⁰
The Netherlands	Industrial consumers which are classified as being energy- intensive ¹⁵¹ and which concluded a multiple-year agreement with the Dutch government to save energy by improving their energy efficiency.
France	Important reductions exist for industrial consumers where the CSPE (of 22,5 €/MWh) amounts to at least 0,5% of their added value. For example, for a 10 GWh/year consumer an added value of 45 million euros or less in the annual accounts is needed, in order to qualify for this criteria (i.e. the CSPE amounts to at least 0,5% of the added value),
Flanders	Reductions exist for industrial consumers with an electro- intensity over 20% for sectors that are listed in annexes 3 and 5 of the EEAG (super-cap of 0,5% of gross added value) and for all consumers belonging to sectors that are listed in annex 3 of the EEAG (cap of 4% of gross added value).

Table 4 – National electro-intensity criteria

The second result, on the other hand, is valid for non-electro-intensive industrial consumers in Belgium. It compares the prices in the three Belgian regions to the top range of prices observed in the neighbouring countries; assuming that, in each of the neighbouring countries, the 'competitors' of Belgian industrial consumers **do not qualify for the national electro intensity criteria and hence pay the maximum price.**

For both the electro-intensive and non-electro-intensive cases, the same prices for natural gas are presented. Whenever a range of results in neighbouring countries was available, we compared the prices in the three Belgian regions to the middle of the range of the neighbouring countries.

On a Belgian level, the information to identify the importance of electro-intensive companies within each of the industrial sectors under review is lacking. However, it is possible to give an indication on a purely macro-economic level as to the sector wide electro-intensity (and gas-intensity). It has to be clearly said that behind these macro-level numbers, a lot of complexity in terms of specific sub-sectors and consumer profiles is hidden. Nevertheless, they do shed a light on sector-wide energy-intensity in Belgium, and on the severity of the criteria in the neighbouring countries.

To have an idea on how the electro-intensity criteria of the neighbouring countries relates to the level of electro-intensity in Belgium and its top 5 important sectors, first the concept of energy cost is introduced in this section based on :

- the electricity and gas prices for each sector and every region (in €/MWh) on the one hand (Figure 31)
- MWh/€ of added value for electricity and gas (or energy intensity) per sector on the other hand (Figure 32).

 $^{^{}_{150}}$ These consumers have a significant reduction on their EEG-Umlage (base rate of 64,05 $\mbox{€/MWh}\mbox{)}.$

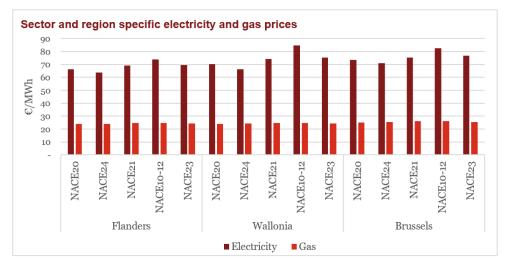
¹⁵¹ An energy-intensive company is a company for which the costs of energy or electricity is more than 3% of the total value of production or the energy taxes and tax on mineral oils is at least 0,5% of the added value (Wet Belastingen op Milieugrondslag, Artikel 47, 1p).



The energy cost expresses the cost of electricity and gas for the whole sector in terms of added value.

As it can be observed from Figure 31, the electricity prices are the highest for the NACE 10-12 sector, as in that sector, the most expensive consumer profiles E1 and E2 are relatively well represented (see Figure 26).

Figure 31 – Sector and region specific electricity and gas prices in 2019¹⁵²



The energy intensity figures have been presented for the first time in the 2016 report. As it is illustrated in Figure 32, these figures are higher for gas than for electricity and vary significantly throughout the different sectors. Sectors that have high values for MWh/ ε of added value are seen to be energy intensive, as is the case for the NACE 24 and, to a lesser extent, the NACE 23. The food & beverages sector (NACE 10-12) is the least energy intensive sector of those in the scope of the present study. As it was the case in the 2016, 2017 and 2018 reports, this year again no separate data for the NACE 20 and 21 sectors were available.

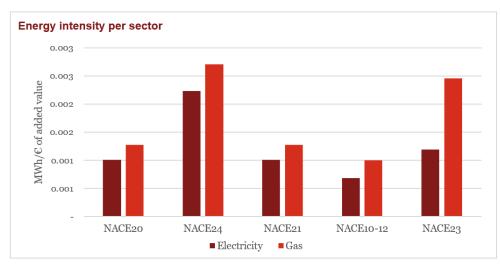


Figure 32 – Energy intensity per sector¹⁵³

Combining the sector and region specific electricity and gas prices with the energy intensity figures results in a measure that represents the electricity or gas cost as a

¹⁵³ Source: Federal Planning Bureau, Eurostat, PwC Calculations

¹⁵² Source: CREG (2014), PwC Calculations



percentage of added value (presented in Figure 33). These are retrieved according to the following formulas:

 $\begin{array}{l} \textit{Electricity cost for Sector i in Region j (\% of added value)} \\ = P_{elec} \textit{ for Sector i in Region j} \\ * \textit{Energy intensity (electricity) for Sector_i} \end{array}$

Gas cost for Sector i in Region j (% of added value) = P_{gas} for Sector i in Region j * Energy intensity (gas) for Sector_i

Figure 33 – Energy cost as % of added value¹⁵⁴



From Figure 33 it is apparent that, although gas is relatively more consumed (see Figure 34) in the production process than electricity, its cost as a percentage of the added value is much lower than for electricity. This is caused by the relatively low gas prices in comparison with those of electricity and the fact that the consumption of gas per euro of added value is just slightly higher than the one of electricity. Furthermore, it is observed that the electricity cost per added value is the highest for the NACE 24 (E4 predominance) and NACE-23 sectors (E3 predominance) in all regions, while the energy cost in general is the lowest for the NACE 10-12 sectors in all regions (E2 predominance).

As previously stated, in Germany, France and the Netherlands, certain industrial consumers can apply for reductions or exemptions in their energy taxes, based on national criteria. Most of these criteria are linked to the cost of energy expressed as a percentage of added value (see Table 4). For example, in Germany, the criteria to benefit from a lower tax scheme is an electricity cost higher than 14% of the added value. As depicted by Figure 33, no sector (but NACE 24) in Belgium attain an electricity cost higher than 14% on a sector-wide level. However as these are aggregate figures that hide information on the level of the industrial consumer, some individual industrial consumers could have a higher electro-intensity than the average and hence have to compete with consumers that qualify as electro-intensive in the neighbouring countries. For those energy-intensive companies, as we will see in the next section, there could be a substantial disadvantage compared to their German competitors.

Weighted energy cost differences

The sector and region specific electricity and gas price differences retrieved in section 8.1.2 are useful as they make it possible to compare electricity and gas prices for a certain sector and region with the European average. However, they cannot teach us whether the energy cost as a whole is advantageous or not. This depends on the amount of electricity and gas that is consumed throughout the production process. As this information is publicly available, we will outlay in this section how

¹⁵⁴ Source: Federal Planning Bureau, Eurostat, PwC Calculations



we can combine the electricity and gas price differences with the consumption volumes of both energy types in one single measure: the weighted energy cost difference. This measure makes it possible to compare the overall energy cost within a certain sector and region with the European average. If an industrial consumes a lot of electricity and almost no gas during the process, most likely the prices of electricity will have a large impact on the energy bill. The weighted energy cost difference is calculated according to the following formulas¹⁵⁵:

$$Energy \ cost \ difference \ for \ Sector_i \ in \ Region_j \left(in \frac{\epsilon}{MWh} \right) \\ = \frac{\left(European \ average \ of \ P_{elec} \ for \ Sector_i \ * \ X_{ij} \right) * \ C_i + (European \ average \ of \ P_{gas} \ for \ Sector_i \ * \ Y_{ij})}{C_i + 1}$$

 $European average of P_{energy} for Sector_i$ $= \frac{(European average of P_{elec} for Sector_i) * C_i + European average of P_{gas} for Sector_i}{C_i + 1}$

Weighted energy cost difference for Sector_i in Region_j (in %) = $\frac{Energy \cos t \, difference \, for \, Sector_i \, in \, Region_j}{European \, average \, of \, P_{energy} \, for \, Sector_i}$

The relative consumption (C_i) used in the first equation to calculate the energy cost difference is the ratio between the total volume of electricity and the total volume of gas consumed in every sector. It represents which of the two energy types are the most intensively used during the production process. It is calculated based on macro-economic data from the energy consumption accounts we retrieved for every sector (Federal Planning Bureau). An overview of the relative consumption per sector can be found in Figure 34.

The volume of each energy type consumer per sector is presented on the left axis, while the relative consumption (amount of electricity divided by the amount of gas) is presented on the right axis. It is apparent that all of the top 5 most important sectors have a relative consumption lower than 1, meaning that all of the top 5 most important sectors consume more gas than electricity during the production process. For NACE 24, the consumption is relatively balanced (relative consumption of 0.82), but within the NACE 23 sector, almost twice as much gas is consumed (relative consumption of 0.48). Please note that for the chemical (NACE 20) and the pharmaceutical (NACE 21) sectors the same consumption figures have been used because of the lack of more detailed data (see section 3 of the 2016 report).

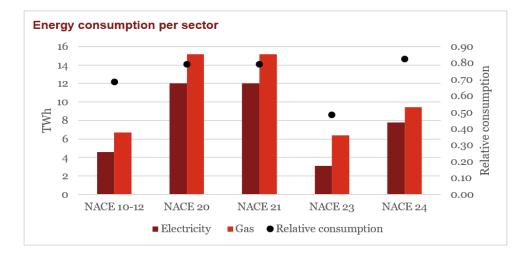


Figure 34 – Energy consumption per sector¹⁵⁶

¹⁵⁵ Where Xij refers to the electricity price for Sector i in Region j and Yij refers to the gas price for Sector i in Region j

¹⁵⁶ Source: Federal Planning Bureau, PwC calculations



The relative consumption plays a significant role in calculating the weighted energy cost differences, as the lower the value for C_i is (the more gas is being consumed in relation to electricity during the production process), the higher will be the importance of gas prices in the total energy cost and in the calculation of the weighted energy cost differences.

The results of the electricity and gas price differences for both electro-intensive as non-electro-intensive consumers and the calculation of the weighted energy cost differences are presented in Table 5. These electricity and gas price differences have been calculated for the whole sector. As they are presented on a macro level, it is possible that they will hide important differences between industrial consumers within a sector.

Region	Sector	Electricity price difference (electro- intensive)	Electricity price difference (non electro- intensive)	Gas price difference	Relative Consumption	Weighted energy cost difference (electro- intensive)	Weighted energy cost difference (non-electro- intensive)
	NACE20	1.5%	-22.8%	-11.3%	0.79	-2.8%	-19.7%
	NACE24	0.0%	-24.7%	-12.4%	0.82	-4.2%	-21.4%
Flanders	NACE21	3.9%	-20.1%	-14.8%	0.79	-2.5%	-18.6%
	NACE10-12	2.3%	-19.3%	-14.8%	0.68	-3.8%	-18.0%
	NACE23	3.5%	-20.3%	-12.4%	0.48	-3.6%	-17.4%
	NACE20	7.0%	-21.8%	-11.1%	0.79	1.0%	-18.9%
	NACE24	3.7%	-24.5%	-12.1%	0.82	-1.6%	-21.1%
Wallonia	NACE21	10.9%	-18.5%	-14.4%	0.79	2.3%	-17.4%
	NACE10-12	16.5%	-13.2%	-14.4%	0.68	5.5%	-13.6%
	NACE23	11.2%	-18.4%	-12.1%	0.48	0.7%	-16.0%
	NACE20	13.5%	-17.1%	-7.8%	0.79	6.4%	-14.6%
	NACE24	12.7%	-17.9%	-8.4%	0.82	5.6%	-15.4%
Brussels	NACE21	13.8%	-16.6%	-9.6%	0.79	5.7%	-14.6%
	NACE10-12	14.3%	-14.9%	-9.6%	0.68	5.8%	-13.4%
	NACE23	14.5%	-16.0%	-8.4%	0.48	4.2%	-13.2%

Table 5 – Results for every industrial sector in Flanders, Wallonia and Brussels when compared to the average prices in Germany, France, the Netherlands and the UK (2019)¹⁵⁷

Competitive advantage	
Competitive disadvantage	

This year, industrial consumers of all sectors in Flanders competing with electrointensive consumers in the neighbouring countries have a slight competitive advantage, ranging between 2.5% and 4,2%. With regards to the other regions, cross-sectors industrial consumers face competitive disadvantages up to 6.4%(except for sector NACE 24 in Wallonia).

For industrial consumers in the three Belgian regions which compete with nonelectro intensive competitors in Germany, France, the Netherlands and the UK, the situation remains particularly competitive. This conclusion can also be drawn based on Figure 35. A negative percentage symbolizes a price level lower than in the average of the neighbouring countries, and hence a competitive advantage.

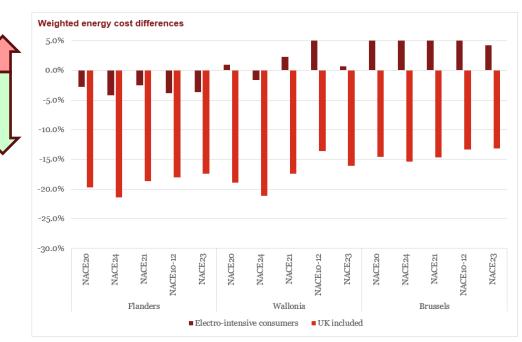
¹⁵⁷ Source: Federal Planning Bureau, CREG, PwC calculations



Competitive disadvantage

Competitive advantage

Figure 35 – Weighted energy cost differences for electro-intensive and non-electro intensive consumers ¹⁵⁸



As it can be observed from Figure 35, there are variations within the regions: all sectors in Flanders benefit from a competitive advantage whereas the Walloon (except for NACE 24) and Brussels regions face competitive disadvantages in all sectors regarding the weighted energy cost differences when comparing electrointensive consumers. Both in Flanders and Wallonia, the basic metal sector (NACE 24) has the most advantageous weighted energy cost. This is mainly due to the importance of the E4 profile –that is the most competitive one for all Belgian regions – within that sector. In Wallonia, the NACE 10-12 sector almost has the highest disadvantageous weighted energy cost, because the most expensive profiles E1 and E2 are relatively well represented in that sector. In Brussels, every sector suffers from a similar disadvantage regarding energy costs.

Weighted energy cost differences for non-electro-intensive consumers are substantial and negative (advantageous) for all regions and sectors in Belgium. When comparing with non-electro-intensive consumers in neighbouring countries, weighted energy prices in Belgium are between 13,2% and 21,4% below the average of the neighbouring countries.

Weighted energy cost differences when excluding the UK

The comparison of energy prices in the Belgian regions to the average of the four neighbouring countries under review brushes over part of the complexity of the results that were shown in section 6 and 7. Most importantly, we have observed that the UK was a distinctive outlier at the high end for all four consumer profiles for electricity, especially when it comes to electro intensive consumers. Consequently, it is also interesting and relevant to do the same exercise in terms of total energy prices differences between the Belgian regions and the neighbouring countries without taking into account the UK.

When excluding the UK from the price comparisons, the situation on a sectoral level is very different for consumers in Belgium that compete with consumers qualifying as electro intensive consumers in the

¹⁵⁸ Source: Federal Planning Bureau, CREG, PwC Calculations



neighbouring countries: they now face a competitive disadvantage instead of a competitive advantage. For consumers in Belgium competing with non-electro intensive consumers in the neighbouring countries, the impact is less important and does not affect the overall conclusion that they benefit from an important competitive advantage.

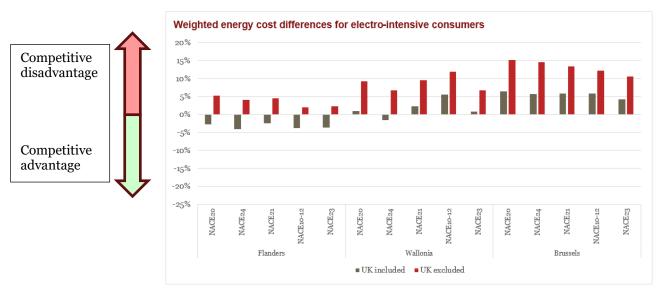
The results when comparing for (non-)electro-intensive consumers can be found in Table 6 below. The weighted energy cost differences for electro-intensive consumers and non-electro-intensive consumers can be found in Figure 36 and Figure 37.

Table 6 – Results for every industrial sector in Flanders, Wallonia and Brussels when compared to the average prices in Germany, France and the Netherlands (2019)¹⁵⁹

Region	Sector	Electricity price difference (electro- intensive)	Electricity price difference (non electro- intensive)	Gas price difference	Relative Consumption	Weighted energy cost difference (electro- intensive)	Weighted energy cost difference (non-electro- intensive)
	NACE20	15.2%	-23.1%	-12.1%	0.79	5.3%	-20.1%
	NACE24	14.1%	-24.8%	-13.4%	0.82	4.0%	-21.7%
Flanders	NACE21	16.9%	-20.7%	-16.3%	0.79	4.5%	-19.5%
	NACE10-12	13.5%	-20.3%	-16.3%	0.68	2.0%	-19.1%
	NACE23	16.7%	-20.9%	-13.4%	0.48	2.2%	-18.1%
	NACE20	21.3%	-22.1%	-11.8%	0.79	9.2%	-19.3%
	NACE24	18.2%	-24.5%	-13.1%	0.82	6.7%	-21.4%
Wallonia	NACE21	24.7%	-19.2%	-15.8%	0.79	9.5%	-18.2%
	NACE10-12	29.2%	-14.3%	-15.8%	0.68	11.8%	-14.8%
	NACE23	25.2%	-18.9%	-13.1%	0.48	6.8%	-16.8%
	NACE20	28.8%	-17.4%	-8.6%	0.79	15.2%	-15.0%
	NACE24	28.6%	-18.0%	-9.4%	0.82	14.6%	-15.7%
Brussels	NACE21	28.0%	-17.2%	-11.1%	0.79	13.4%	-15.5%
	NACE10-12	26.8%	-15.9%	-11.1%	0.68	12.2%	-14.5%
	NACE23	29.0%	-16.6%	-9.4%	0.48	10.5%	-13.9%

Competitive advantage Competitive disadvantage

Figure 36 – Weighted energy cost differences for electro-intensive consumers¹⁶⁰



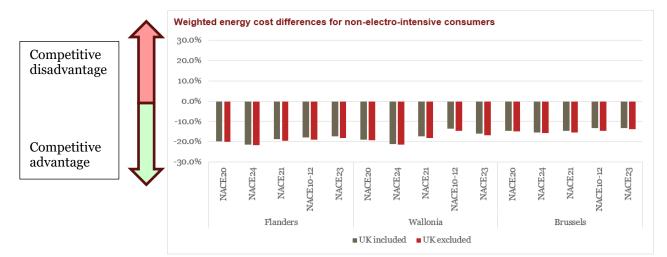
¹⁵⁹ Source: Federal Planning Bureau, CREG, PwC Calculations

¹⁶⁰ Source: Federal Planning Bureau, CREG, PwC Calculations

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Figure 37 – Weighted energy cost differences for non-electro-intensive consumers¹⁶¹



¹⁶¹ Source: Federal Planning Bureau, CREG, PwC Calculations

8.2 Conclusions and recommendations

Conclusions on competitiveness of the economy

We can draw some important conclusions from this analysis of the total energy cost. Even though it is necessary to apply caution to the exact impact of these findings, given their strong reliance on a host of macro-level data, certain messages are very clear.

1. The most striking conclusion in terms of energy competitiveness is not different from the last three years as the situation for all important industrial sectors in Belgium is **less beneficial when they compete with electro-intensive consumers** in neighbouring countries, than when they compete with non-electro intensive consumers in neighbouring countries¹⁶².

Even when taking the UK (high outlier) out of the equation, industrial consumers in Belgium, which compete with non-electro intensive consumers in the neighbouring countries have a clear competitive advantage in terms of total energy cost (gas and electricity combined). For industrial consumers, which compete with counterparts in neighbouring countries that benefit from reductions for electro-intensive consumers, the situation is different. Their total energy cost constitutes an important competitiveness problem when the UK is not included in the comparison. However, when the UK is included in the comparison, all sectors from Flanders and NACE 24 in Wallonia benefit from a slight competitive advantage.

In countries where reductions are given to electro-intensive consumers, government is shifting investment away from non-electro intensive sectors towards electro-intensive sectors, as the Energy and Environmental State Aid Guidelines of the European Commission demand. This shift is the (indirect) result of an (EC allowed) economic protection measure targeting electro-intensive consumers. In scenarios with entry criteria (German and Flemish systems), where individual electro-intensity targets at company level need to be reached, even for consumers belonging to electro-intensive sectors, this shift only benefits certain very electro-intensive legal entities within the annex 3 and 5 of the EEAG.

- 2. The **impact of the relatively low gas cost** for industry in Belgium which we observed in section 6 and 7 on total energy cost for industrial consumers is **fairly limited**. Even though some sectors consume twice as much natural gas as electricity (such as NACE 23, other non-metallic mineral products), the low cost per energy unit of natural gas induces that electricity plays the determining role in the total energy cost competitiveness.
- 3. The situation in the **Walloon region** in terms of total energy cost for industry remains generally **less favourable** than in **Flanders**. This is most striking for industrial sectors with an important amount of smaller industrial electricity consumers (E1-E2), such as the food and beverages sector (NACE 10-12).

Recommendations

The **competitiveness problem** on total energy cost that we observe in this report applies to electro-intensive industrial consumers across all sectors and across all regions, but **is similar to the one observed over the past three previous**

¹⁶² Although a cap and super cap on the cost of Green Certificates was introduced in Flanders in 2018.



years. As we have shown in sections 6 and 7 of this report, its origin lies in the electricity cost, and in the three components of the electricity cost: commodity prices, network fees for profiles E3 and E4 (mainly due to reductions granted in Germany, France and the Netherlands) and taxes, levies and certificate schemes.

In terms of policy recommendations, similar measures are proposed. As previously recommended, the most direct and palpable impact can be exerted on the third component: taxes, levies and certificate schemes. At this moment, in the three regions, important efforts are done in terms of mitigating the impact of taxes, surcharges on competitiveness. As opposed to France, Germany and the Netherlands, this is generally done without taking into account the electro-intensity of the industrial consumers. As shown in annex A of this report, the quantity of offtaken electricity remains in 2019 (as it was also the case last year) the prominent criteria that was used on the federal level (federal contribution, offshore) and on the regional level (green certificate quota, public service obligations) – to protect the competitiveness of electricity cost for industrial consumers. Nonetheless, Flanders now takes into consideration electro-intensity since the introduction in 2018 of a supercap on the amount due for the costs related to the financing of renewable energy for electro-intensive consumers.

In other words, from a fiscal point of view, apart from the super cap system introduced in Flanders in 2018, Belgian federal and regional authorities mainly grant reductions and/or exemptions to taxes, levies and certificate schemes based on the level of electricity offtake, and not on the level of electro-intensity of an industrial consumer.

Therefore, the observations made last year remain valid. Indeed, this leads to important competitive advantages for companies that compete with non-electro intensive consumers in France and certainly Germany, while at the same time these reductions cannot sufficiently impact the total energy cost to protect electrointensive industrial consumers from the competition of their electro-intensive counterparts in France, the Netherlands and Germany.

Our economic impact analysis leads us to support this statement: **tax revenues in the Flemish**, **Walloon and Brussels-Capital Regions (also valid for** federal taxes) are directed towards protecting consumers which are not particularly affected by a lack of competitiveness of electricity prices, while more vulnerable consumers in those regions – though less true in Flanders since the super cap introduction – suffer from an important disadvantage compared to their electro-intensive competitors in neighbouring countries.

It is hence very interesting to reflect upon the possibility of adapting the present tax reductions for industrial consumers that have been put in place by federal and regional governments. The general objective should be to generate an evolution towards more competitive total energy prices for electro-intensive industrial consumers, while preserving (part of) the present competitive advantage for nonelectro intensive consumers.

Annex A of this report offers a thorough insight in the large realm of possibilities that policy makers have at their disposal to target electro-intensive consumers. We would like to remind several points and guidelines that were previously stated and that should be taken into consideration:

- 1. In the Belgian case, given the competitive gas prices, it seems important to focus on electro-intensity, and not energy-intensity as a whole.
- 2. The introduction of electro-intensity criteria can be combined with a minimal offtake condition under which no reductions are entitled.
- 3. Introducing too many layers of different access criteria and reduction levels (as is the case for the CSPE-tax in France and the EEG-Umlage in Germany)



can negatively influence the evaluation of the effectiveness of the measures. It can also lower the predictability of fiscal revenue.

4. One should be aware of possible negative side-effects. Granting access to certain reductions based on the load profile (as is the case for grid fee reductions in Germany and the Netherlands) can have the adverse effect of discouraging the development of demand response and energy efficiency.





Appendix: Industry reduction criteria

As an annex to this report, we present the catalogue of criteria that can grant the possibility to reductions on transport tariffs, taxes, levies and certificate schemes for certain (groups of) electricity and gas consumers.

Electricity

Country/ Zone	Criteria	Reduction
Belgium Annual offtake	Annual offtake	Progressive reductions on federal contribution and offshore surcharge:
	(condition: energy efficiency agreement)	- 20-50 MWh/year : -15%
		- 50-1.000 MWh/year : -20%
		- 1.000-25.000 MWh/year : -25%
		- >25.000 MWh/year : -45%
		Capped at 250.000 €/year.
Belgium (Flanders)		Reductions for the compensation of indirect carbon emissions are not taken into account.

Annual offtake

Progressive reductions of the renewables quota:

- 1.000-20.000 MWh/year: -47%*

- 20.000-250.000 MWh/year:-80%

- >250.000 MWh: -98%

* only for industry (NACE 5-33), deep frost alimentary (46391 and 52100) and port handling (52241)..

Additionally, the so-called super cap was introduced in 2018:

- The amount due for the certificate cost related to the financing of renewable energy is capped at 0,5% of gross added value (average last 3 years) for all consumers with an electro-intensity over 20% for consumers belonging to sectors that are listed in annexes 3 and 5 of the EEAG. **(super-cap)**
- The amount due for the certificate cost related to the financing of renewable energy is capped at 0,5% of gross added value (average last 3 years) for all consumers belonging to sectors that are



		listed in annex 3 of the EEAG. (super-cap)
	Annual offtake	Progressive reductions of the combined heat-power quota
		- 1.000-5.000 MWh/year: -47%*
		- 5.000-20.000 MWh/year: -47%
		- 20.000-100.000 MWh/year: -50%
		-100.000-250.000 MWh/year:-80%
		- >250.000 MWh: -85%
		*only for industry (NACE 5-33), deep frost alimentary (46391 and 52100) and port handling (52241).
Belgium (Wallonia)	Annual offtake	Progressive reductions of the renewables quota ¹⁶³ :
	(condition: sectoral energy efficiency	- < 20.000 MWh/year: -25%
	agreement)	- 20.000-100.000 MWh/year: -50%
		-100.000-300.000 MWh/year:-85%
		- >300.000 MWh/year: -90%
	Annual offtake (condition: sectoral energy efficiency agreement)	Partial exemptions of the tariff for public service obligation financing support measures for renewable energy (only Elia), that has a base rate of 13,82 €/MWh
		- Exemption of 85% for final customers with a sector agreement, regardless of the level of consumption;
		- Exemption of 50% for final customers connected to a voltage level higher than low voltage without a sector agreement and with an activity that falls under the NACE code 'culture and animal production' (01 - without distinction between principal and complementary activities);
		- Exemption of 50% for final customers connected to a voltage level higher than low voltage without a sector agreement and with an annual consumption higher than GWh, in so far as they fall under the following primary NACE codes:
		 industrial enterprises (10 to 33); education (85); hospitals (86); medico-social (87-88).
		→ On the exempted part of the consumption, a surcharge of 2,55 €/MWh is due.
	Annual offtake	Connection fee (base rate: 0,75€/MWh) has two reduced tariffs for high voltage clients:

¹⁶³ The Walloon reductions are attributed based on three-month periods of consumption. We transposed them to a yearly basis in order to facilitate comparison.

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- clients < 10 GWh/year: 0,6€/MWh

- clients > 10 GWh/year: 0,3€/MWh

Germany	Reductions for the compensation of indirect carbon emissions are not taken into account.
Annual consumption + offtake hours	Reduction on the transmission tariff apply for all companies that exceed 10 GWh/year, if annual offtake hours exceed:
	- more than 7000 hrs/year: :- 80% - more than 7500 hrs/year :- 85% - more than 8000 hrs/year: -90%
Load profile	In accordance with §19, section 2 S. 1 StromNEV, the TSOs are required to offer an end consumer, in deviation from § 16 StromNEV, an individual grid charge if, based on existing or forecasted consumption data or based on technical or contractual circumstances, it is apparent tha the peak load of an end consumer foreseeably deviates considerably from the simultaneous annual peak load of all sampling of this grid or transformer level.
Annual consumption + electricity cost/turnover	The combined heat and power surcharge (KWK-Umlage has a base rate of 2,8 €/MWh. For users with an annual consumption that exceeds 1 GWh/year two reduced rate exists:
	-If consumption > 1 GWh / year and electricity cost is :
	 For an extensive list of industrial sectors (annex 3 of EEAG): >17% of gross added value For a less extensive list of industrial sectors (annex 5 EEAG): >20% of gross added value
	The rate is 0,42 €/MWh, but capped at: 0,5% of gross added value (average last 3 years) for all consumers with electricity cost >20% of gross added value, and 4,0% of gross added values (average last 3 years) for all consumer with electricity cost <20% of gross added value
	-If consumption > 1 GWh / year and electricity cost is :
	• For an extensive list of industrial sectors (annex 3 of EEAG): between 14 and 17% of gross added value (avg. last 3 years)
	0,56 €/MWh (80% reduction), but capped at 0,5% of gross added value (average last 3 years) for all consumer with electricity cost >20% of gross added value and 4,0% of gross added values (average last 3 years) for all consumers with electricity cost <20% of gross added value
Annual offtake + electricity cost/turnover	The StromNEV §19 – Umlage has a base rate of 3,05 €/MWh. It is applicable to the first GWh offtaken on an annual basis. For offtake that exceeds 1 GWh/year two rates exists:
	 If offtake > 1GWh/year: 0,5 €/MWh If offtake > 1 GWh/year and the consumer is part of the manufacturing industry with electricity cost > 4% of turnover: 0,25 €/MWh



Annual consumption + Electricity cost/ gross added value The EEG-Umlage has a base rate of 64,05 €/MWh.

a) Individual consumers that are part of electro- and trade-intensive sectors (annex 3 of the Commission communication 2014/C200) with a consumption of minimum 1 GWh/year, an individual electricity cost >14% of gross added value, are entitled to a **80% reduction**, <u>and</u> the total amount of the surcharge is capped in all cases at:

- > 0,5% of gross added value (average last 3 years) for all consumers with electricity cost >20% of gross added value
- 4,0% of gross added value (average last 3 years) for all consumers with electricity cost <20% of gross added value

b) Individual consumers with a consumption of minimum 1 GWh/year, that are part of electro- and trade-intensive sectors (annex 3 of the Commission communication 2014/C200) with an individual electricity cost >17% of gross added value, or individual consumers that are part of trade-intensive sectors (annex 5 of the Commission communication 2014/C200) with an individual electricity cost > 20% gross added value are entitled to a 85% reduction, and the total amount of the surcharge is capped in all cases at:

- > 0,5% of gross added value (average last 3 years) for all consumers with electricity cost >20% of gross added value
- 4,0% of gross added value (average last 3 years) for all consumers with electricity cost <20% of gross added value

This reduction system also has a 'floor': a bottom rate of 0,5 €/MWh applies for several industrial sectors (using electricity as a raw material in the production process), and of 1,0 €/MWh for all other industrial sectors.

The EEG-Umlage is only partially due on the consumption of self-generated electricity.

Pension contributions + process criteria	The Stromsteuer (Electricity tax) in Germany has a base rate of 20,5 €/MWh, and a lowered rate of 15,37 €/MWh for all industrial companies.
-	Further reductions are attributed based on the amount of pension contributions a company pays: the fewer pension contributions (on which the state has given some reductions) a company pays, the more right it has to reductions on the Electricity tax. The maximum reduction is 90%.
	A company that uses electricity as a raw material is exempted from the tax.
Annual offtake + electricity cost/turnover	The Offshore liability overload is a levy to pay for offshore wind power generation units. Different rates apply to different bands of offtake:
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- For an offtake of less than or equal to 1 GWh/year: 4,16 $\ensuremath{\mathfrak{C}/\mathrm{MWh}}$



		- For an offtake above 1 GWh/year: 0,624 €/MWh for the offtake above 1 GWh/year
		- For consumers with an offtake above 1 GWh/year and manufacturing industry with electricity cost >4% of turnover: 0,832 €/MWh for the offtake above 1 GWh/year
	(indirect) electricity cost/turnover	For the Concession fee (Konzessionsabgabe) on electricity, all industrial consumers benefit from a basic rate of 1,1 €/MWh.
		If an industrial consumer's total electricity bill is below an annually fixed threshold (2016: €125€/MWh) it is exempted from the Concession fee. In other words: companies that pay the full rate on the EEG-Umlage will almost certainly pay the concession fee as well. The Concession fee can be seen as an amplifier of other reduction.
France		Reductions for the compensation of indirect carbon emissions are not taken into account.
	Load profile + annual offtake+ offtake/value added + trade intensity	On transmission tariffs, several reductions apply. <u>Group A</u>
		A1. Stable consumption profiles, annual offtake >10 GWh/year and over 7000 hours,
		A2. Anti-cyclical profiles, annual offtake >20 GWh/year and off peak grid utilisation over 44%
		A3. Large consumers, annual offtake >500 GWh/year and off peak grid utilisation between 40-44%
		Group A is granted :
		-80% reduction when hyper electro intensive
		-45% reduction when electro intensive
		-5% reduction when none of both
		<u>Group B</u>
		B1. Stable consumption profiles, >10 GWh/year and over 7000 hours,
		B2. Anti-cyclical profiles, annual offtake >20 GWh/year and off peak grid utilisation over 48%
		Group B is granted:
		-85% reduction when hyper electro intensive
		-50% reduction when electro intensive
		-10% reduction when none of both



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	C1. Stable consumption profiles, >10 GWh/year and over 8000 hours
	C2. Anti-cyclical profiles, annual offtake >20 GWh/year and off peak grid utilisation over 53%
	Group C is granted:
	-90% reduction when hyper electro intensive
	-60% reduction when electro intensive
	-20% reduction when none of both
	Hyper electro intensity is defined as > 6 kWh consumption per euro of added value, with a trade- intensity over 25%. Electro-intensity is defined as >2,5 kWh of consumption per euro of added value with a trade- intensity over 4% and annual offtake over 50 Gwh.
Offtake/value added	The CSPE-surcharge has a base rate of 22,5€/MWh. Three reductions apply, based on consumption criteria:
	1. For electro-intensive consumers where the CSPE would have been (without reductions and exemptions) at least equal to 0,5% of added value, the CSPE is equal to:
	- for consumers consuming above 3 kWh per euro of added value, CSPE is equal to 2 €/MWh
	- for consumers consuming between 1,5 and 3 kWh per euro of added value, CSPE is equal to 5 €/MWh
	- for consumers consuming below 1,5 kWh per euro of added value, CSPE is equal to 7,5 €/MWh
	2. For very electro-intensive consumers, the tariff amounts to 0,5 €/MWh. To be very electro-intensive, consumers must satisfy both conditions:
	- its energy consumption represents more than 6 kWh per euro of added value;
	- its activity belongs to a sector with a high trade intensity with third countries (> 25%).
	3. Sectors with a high risk of carbon leakage are metallurgy, electrolysis, non-metal minerals or chemical sectors. For electro-intensive consumers described under (i) above with a high risk of carbon leakage linked to indirect carbon emissions, the CSPE amounts to :
	- for consumers consuming above 3 kWh per euro of added value, CSPE is equal to 1 €/MWh ;
	- for consumers consuming between 1,5 and 3 kWh per euro of added value, CSPE is equal to 2,5 €/MWh ;
	- for consumers consuming below 1,5 kWh per euro of added value, CSPE is equal to 5,5 €/MWh.
Grid level	The "Contribution tarifaire d'acheminement" (CTA) for electricity is a surcharge for energy sector pensions. It amounts to 27,04% of the fixed part of the transport tariff



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		for consumers connected to the distribution grid. One reduction applies, based on grid level criteria:
		- For consumers connected directly to the transmission grid or those who are connected to the distribution grid on or above 50 kV (E2; E3 and E4), the CTA amounts to 10,14 % of the fixed part of the transmission tariff.
The Netherlands	Annual offtake + load profile	A substantial reduction ("volumecorrectie") on transport tariffs is granted to large baseload consumers when they meet both criteria
		 Annual consumption > 50 GWh/year Annual off peak consumption > 65% of all 2.920 annual off-peak hours
		Reductions are incremental and cannot exceed 90%
Annual consumption	Annual consumption	The energy tax is a digressive tax:
	-	 o to 10 MWh/year: 98,63 €/MWh 10 to 50 MWh/year: 53,37 €/MWh 50 to 10.000 MWh/year: 14,21 €/MWh
		above 10.000 MWh/year: 0,58 \mathbb{C}/MWh
	Annual consumption	The ODE-levy is a digressive levy, except for the first 10 MWh:
		 o to 10 MWh/year: 18,9 €/MWh 10 to 50 MWh/year: 27,80 €/MWh 50 to 10.000 MWh/year: 7,4 €/MWh
		above 10.000 MWh/year: 0,3 €/MWh
Annual consumption + taxes/added value + process criteria	The teruggaafregeling is destined for industrial consumers who are classified as being energy-intensive and who concluded a multiple-year agreement with the Dutch government to save energy by improving their energy efficiency. These consumers can apply for a refund of any tax paid above their consumption of 10.000 MWh after each financial year. The refund is equal to the part that has been charged above the European minimum tax level per MWh (o,5 €/MWh).	
		An energy-intensive company is a company for which the costs of energy or electricity is more than 3% of the total value of production or the energy taxes and tax on mineral oils is at least 0,5% of the added value (Wet Belastingen op Milieugrondslag , Artikel 47, 1p).
		An exemption is also granted to those industrials that use their electricity for chemical reduction, electrolytic and metallurgic processes.
UK	Energy efficiency	The Climate Change Levy has a base rate of 6,58 €/MWh. When users have signed up to a Climate Change Agreement (sectoral or individual), they can obtain a 90% reduction.

 $\overline{\rm CREG}$ – A European comparison of electricity and gas prices for large industrial consumers 25 April 2019



Gas

Country/Zone	Criteria	Reduction
Belgium	Annual consumption	Progressive reductions on federal contribution (0,6043 €/MWh)
		- 20-50 GWh/year : -15%
		- 50-250 GWh/year : -20%
		- 250-1.000 GWh/year : -25%
		- 1.000 GWh/year : -45%
		Annual cap of 750.000 \mathbb{C} /year by consumption site.
	Energy efficiency + sector criteria	Energy contribution with a base rate of 0,9978 $€$ /MWh.
		Companies part of an energy efficiency agreement pay 0,54 €/MWh.
		Companies that use natural gas as a raw material are totally exempted.
Belgium (Wallonia)	Annual consumption	Digressive rates apply to the connection fee in the Walloon region. For the first 100 kWh, the rate is 7,5 €/MWh for all consumers. Above that base rate, different rates apply to different consumers:
		 0,75 €/MWh for consumers with an annual consumption below 1 GWh 0,06 €/MWh for consumers with an annual consumption from 1 to 10 GWh 0,03 €/MWh for consumers with an annual consumption equal to or above 10 GWh
Germany	Pension contributions + sector criteria	The Energiesteuer (Energy tax) on gas in Germany has a base rate for industrial use of 5,5 €/MWh, and a standard reduction to 4,12 €/MWh.
		Further reductions are attributed based on the amount of pension contributions a company pays: the fewer pension contributions (on which the state has given some reductions) a company pays, the more right it has to reductions on the Energy tax. The minimum rate is 2,07 C /MWh.
		When a company uses natural gas for purposes other than fuel or heating, it is exempted from the Energy tax on gas.
	Annual consumption	The Biogas Levy is a nationwide standard biogas levy since January 1, 2014. This Biogas levy for 2018 amounts to approximately 0,66193 €/(kWh/h)/a.



France	Carbon market participation +	The TICGN tax has a base rate of 8,45 €/MWh.
	sector criteria	Companies that participate in the carbon market and that are energy intensive can pay a reduced rate: 1,52 $€/MWh$;
		Companies that belong to a sector with a high risk of carbon leakage and that are energy intensive can pay reduced rate: 1,60 €/MWh.
		Companies that do not use natural gas as a fuel (for example as a raw material) are exempted from the TICGN.
	Grid level	The "Contribution tarifaire d'acheminement" (CTA) is a surcharge for energy sector pensions. For clients connected to the distribution grid, the CTA amounts t 20,8% of the fixed part of the transmission tariff. One reduction applies:
		- For clients directly connected to the transmission grid, the CTA amounts to 4,719 of the fixed part of the transmission tariff.
The Netherlands	Annual consumption +	The energy tax is a digressive tax:
	sector criteria	 - 0 to 170.000 m³/year: 0,293 €/m³ - 170.000 to 1.000.000 m³/year: 0,0654 €/m³
		 1.000.000 to 10.000.000 m³/year: 0,0238€/m³ above 10.000.000 m³/year: 0,0128 €/m³
		Companies that do not use natural gas as a fuel (for example as a raw material) are exempted from the energy tax.
	Annual consumption +	The ODE levy is a digressive tax:
	sector criteria	 0 to 170.000 m³/year: 0,0524 €/m³ 170.000 to 1.000.000 m³/year: 0,0161 €/m 1.000.000 to 10.000.000 m³/year: 0,0059 €/m³
		- above 10.000.000 m ³ /year: 0,0021 €/m ³
		Companies that do not use natural gas as a fuel (for example as a raw material) are exempted from the energy tax and the ODE Levy.
UK	Energy efficiency + sector criteria	The Climate Change Levy has a base rate of 2,294 €/MWh for natural gas (January 2019). When users have signed up to a Climate Change Agreement (sectoral or individual), they obtain a 35% reduction (+/- 1,49 €/MWh).
		Companies that do not use natural gas as a fuel (but for example as a raw material) are exempted from the climate change levy on gas.