
Comparing electricity prices for industry

An elusive task – illustrated by the German Case

ANALYSIS

Agora
Energiewende



Comparing electricity prices for industry

IMPRINT

ANALYSIS

Comparing electricity prices for industry
An elusive task – illustrated by the German Case

CREATED BY

Agora Energiewende
Rosenstraße 2 | 10178 Berlin

Project lead:

Dimitri Pescia
dimitri.pescia@agora-energiewende.de

Christian Redl
christian.redl@agora-energiewende.de

Editor: Mara Marthe Kleiner
Proof reading: WorldSolid, Berlin
Typesetting: Tozman Satz & Grafik, Berlin
Cover: © Oleksiy Mark – Fotolia

036/02-A-2014/EN

Published: June 2014

Scope of this paper

The competitiveness of energy-intensive industries in Europe is a subject of heated debate among various stakeholders at present – not least because energy prices are perceived as being higher in European countries than in many other regions worldwide. This paper aims to shed light on the discussion, both quantitatively and qualitatively. It starts with a comparison of wholesale spot electricity prices in different EU member states and selected US power markets, performing a first assessment of different industrial energy cost structures. This comparison is particularly relevant for energy-intensive industries, which are typically exempt from various supplemental price components, like grid tariffs and renewable energy levies. The paper then discusses the methodological difficulties associated with comparing industrial end-use prices in different countries. Case studies serve as illustrative examples.

Key Findings

1.

Wholesale spot power prices are on the decline in many parts of Europe, and are lowest in Germany and Central Eastern Europe (especially in Poland and the Czech Republic). Meanwhile, prices have been rising in the US. Since 2011, spot prices have been decreasing in Europe, except for in the UK, Belgium and the Netherlands. While spot prices in Germany were higher than in the US during 2010-2012, in 2013 they fell below the New York ISO prices, and converged with those of other US regions. In many other European markets, the gap with US prices remains significant.

2.

Wholesale market prices can serve as a starting point for comparing the energy costs of European industries, especially energy-intensive industries. Nevertheless, this approach has inherent limitations: (1) Wholesale prices don't necessarily accurately reflect the "energy component" of prices paid by end users, due to differences in purchasing strategies, long-term contracts and potential price regulation; (2) Several additional components must be taken into account as well (grid tariffs, renewable levies and other taxes), from which industrial actors may receive partial or full exemptions.

3.

While numerous European companies have complained of market distortion due to regulatory favouritism for Germany's energy-intensive industries, caution must be exercised when attempting to directly compare industrial end-use prices between countries and sectors. Against the backdrop of decreasing wholesale prices and increasing exemptions for energy-intensive consumers in Germany, several EU member states have argued that domestic regulations in Germany create market distortions that unduly favour German firms. Because firms in different regions and sectors vary considerably in the extent to which they pay wholesale market prices and/or receive tax exemptions and levy reductions, comparing prices between sectors and countries is a difficult task. The heterogeneity of the situation is not fully and transparently captured by European statistics.

Zusammenfassung

Hohe Strompreise werden häufig als Hemmnis für die Wettbewerbsfähigkeit der energieintensiven Industrie in Europa genannt – vor allem, weil das Preisniveau in einigen EU-Ländern als höher als in anderen Regionen der Welt angesehen wird. Die vorliegende Studie beleuchtet diese Diskussion aus quantitativer und qualitativer Sicht. Sie beginnt mit einer Analyse der Strompreise in verschiedenen europäischen und ausgewählten amerikanischen Stromgroßhandelsmärkten, und ermöglicht damit einen Vergleich der industriellen Energiekostenstrukturen. Der Börsenstrompreis ist für energieintensive Industrien besonders relevant, da diese in der Regel von anderen Strompreiskomponenten, wie Netzentgelten oder Umlagen für Erneuerbare Energien, weitgehend befreit sind. Im zweiten Teil der Analyse werden

die methodischen Schwierigkeiten bei dem Vergleich von industriellen Endkundenpreisen in verschiedenen Ländern diskutiert. Fallstudien dienen als anschauliche Beispiele.

Die Ergebnisse auf einen Blick

1.

Großhandelsstromspotpreise sind in großen Teilen Europas rückläufig. Am niedrigsten sind sie in Deutschland und Mittel- und Osteuropa, insbesondere in Polen und der Tschechischen Republik. In den USA werden hingegen steigende Preise beobachtet. Seit 2011 fallen die Strompreise tendenziell in allen europäischen Spotmärkten, mit Ausnahme von Großbritannien, Belgien und den Niederlanden. Die Preise in Deutschland waren von 2010 bis 2012 durchweg höher als alle US-Spotpreise, fielen dagegen im Jahr 2013 unter das Preisniveau des US New York ISO Marktes und nähern sich denen der restlichen US-Regionen. Für viele andere europäische Märkte bleibt die Lücke mit US-Preisen bestehen.

2.

Großhandelsstrompreise können als Grundlage für einen Vergleich der Energiekosten der europäischen Industrie, vor allem der energieintensiver Industrien, dienen. Dieser Ansatz hat jedoch inhärente Grenzen. Die beiden Einschränkungen sind: (1) aufgrund von unterschiedlichen Einkaufsstrategien, langfristigen Verträgen und regulierten Preisen in einigen Märkten entsprechen die Großhandelspreise nicht unbedingt vollständig den Strombeschaffungskosten der Endkunden; (2) zusätzliche Komponenten müssen ebenso berücksichtigt werden (Netzentgelte, EEG-Umlage und sonstige Abgaben und Steuern), da Industriekunden ganz oder teilweise befreit sein können.

3.

Energieintensive Industrien aus anderen europäischen Ländern sehen in den niedrigen Strompreisen eine Marktverzerrung zugunsten der deutschen energieintensiven Industrie. Ein direkter Vergleich industrieller Endkundenpreise zwischen Ländern und Sektoren muss jedoch äußerst vorsichtig vorgenommen werden. Im Zusammenhang mit sinkenden Großhandelspreisen und erweiterten Ausnahmeregelungen für energieintensive Industrien in Deutschland haben mehrere Mitgliedstaaten die Frage nach möglichen Marktverzerrungen zu Gunsten der deutschen Industrie gestellt. Ein Vergleich industrieller Endkundenpreise zwischen Sektoren und Ländern ist auch deshalb eine schwierige Aufgabe, weil Unternehmen in unterschiedlichem Maße dem Großhandelspreis ausgesetzt sind und bestehende Ausnahmeregelungen sehr divers sind. Die Heterogenität der Situation wird nicht vollständig und transparent durch die europäische Statistik adressiert.

Content

1	Comparing wholesale power price developments	6
2	The elusive task of comparing industrial end-use electricity prices	8
3	Case studies on German energy intensive industries and their European competitors	10
4	Conclusion	13
5	References	14
6	Annex	15

1 Comparing wholesale power price developments

Clearly, the cost of electricity generation constitutes an important component of end-use electricity prices. In liberalized electricity markets, electricity wholesale prices reflect these costs (as prices are set by the short-run marginal costs of the most expensive power plant needed to meet electricity demand).

A comparison of wholesale power spot prices in Europe (Figure 1) shows following trends:

- The prices in the Nordic region (42.3 euros/MWh on average between 2010 and 2013) generally constitute the lower bound of wholesale prices in Europe, although they fluctuate widely from year to year depending on weather conditions and, in particular, hydro power availability. Wholesale spot prices are the highest in the UK and Italy (61.6 and 63 euros/MWh, respectively, in 2013).
- In 2010 and 2011 similar price levels prevailed in (1) Austria and Germany (which form one price zone); (2) Belgium, France, the Netherlands and Switzerland (as the markets of these countries are coupled); and in (3) the Czech Republic and Poland (although these countries have not been formerly coupled to Austria/Germany). Starting in 2012, prices in Austria/Germany, the Czech Republic and Poland started to diverge from prices in the BENELUX countries (Belgium, the Netherlands, and Luxembourg) and France. This trend continued in 2013, intensified by increasing prices in the Netherlands and Belgium.
- In 2013, German and Central Eastern European wholesale power prices were the lowest in Europe. The average German spot price in 2013 (37.8 euros/MWh) was 14.2 euros/MWh lower than the Dutch spot price (52 euros/MWh) and 5.5 euros/MWh lower than the French one. In Ger-

Figure 1: Average yearly wholesale prices (spot market, baseload) in several EU countries.



Power exchanges, own calculations; the annex contains full data, including data in further European countries.

many, a continuous decrease in wholesale prices has been driven by strong growth in renewables (especially in wind and solar PV) and a large (and increasing) share of coal-fired power plant capacity (both hard coal and lignite) in the generation mix.

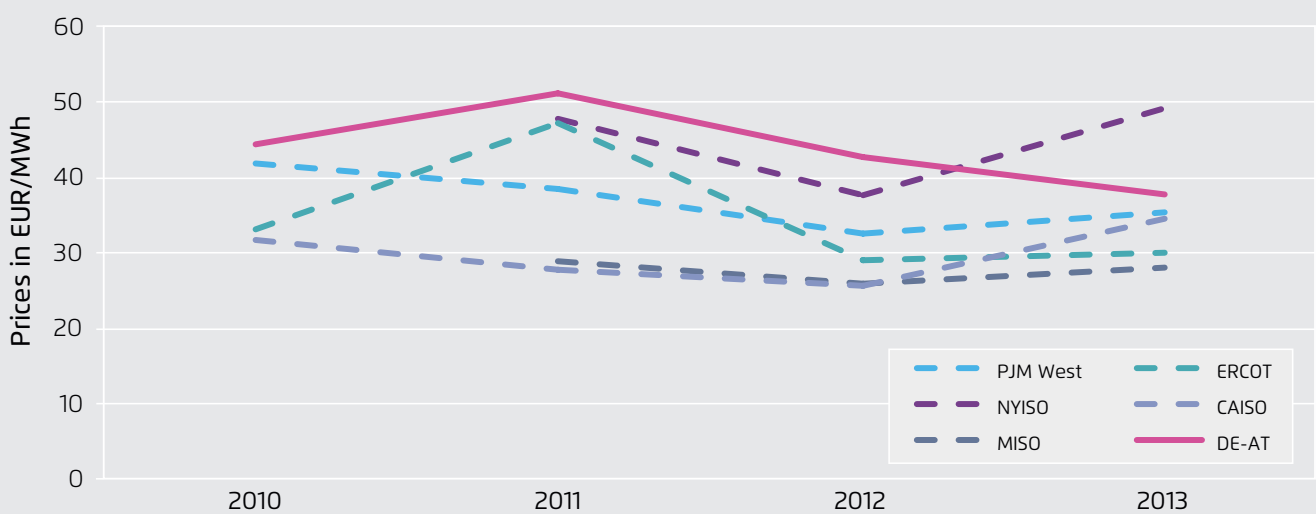
A comparison of German and US wholesale power prices proves interesting, as German industrial actors have been increasingly fearing a loss of competitiveness relative to their American counterparts due to higher electricity prices. As shown in Figure 2, spot prices on liberalized US markets are indeed lower than on European ones; however, since 2012 prices have generally been rising in US markets, which stands in contrast to falling prices in most European markets, especially in Germany. Spot prices in Germany, which were higher than the spot prices in all US markets in 2010–2012, fell below the New York ISO prices in 2013 while converging towards that of other US regions. In many other European markets, the gap to the US remains significant.

Recent US power price increases have mainly been caused by rising US spot prices for natural gas¹. Direct comparisons between European and US power prices need to be performed cautiously, however, as liberalized US markets typically feature capacity mechanisms, and associated capacity payments are not included in the prices shown in Figure 2². Thus, final US industrial consumer costs are underestimated by just comparing wholesale prices.

1 For example, the annual average spot price for natural gas at the Henry Hub rose by 35% from 2012 to 2013.

2 For example, in 2012 the capacity payment on the end-use bills in the PJM market amounted to 4.90 EUR/MWh.

Figure 2 Average yearly wholesale prices on selected US spot markets and Germany. Note that US prices represent average weekday prices from 7AM to 11PM.



Power exchanges, own calculations

2 The elusive task of comparing industrial end-use electricity prices

Wholesale market prices can serve as a starting point for comparing the energy costs of European industries. But this comparison has inherent limitations. Industrial actors in Europe – especially energy-intensive firms (with an annual power consumption above 150 GWh³) – often employ various purchasing and hedging strategies in order to both minimize their risks on the market and benefit from the most competitive prices. Some industrial actors buy most (if not all) of their electricity through OTC long-term contracts, which may to a large extent be decoupled from prices observed on organized wholesale power markets. For example, some large industrial firms in France buy their electricity at a fixed price for 15 years through the consortium EXEL-TIUM. Other industrial firms purchase their electricity both through long-term OTC contracts and on the short-term spot and long-term futures markets, making use of several hedging strategies (to protect themselves from rising prices and price volatility). In addition, some companies operate their own power plants completely outside of the market. Finally, some countries – including France – have maintained regulated power prices (in which case up to 90% of the energy component may be regulated, with only 10% effectively influenced by market conditions).

Furthermore, the energy component represents only one of the many components that contribute to the final retail price for electricity. Additional components include grid tariffs, renewable energy levies and any other relevant taxes or surcharges imposed by public authorities. The value of these components varies significantly between different types of consumers and between countries. Small and medium-sized consumers (households, commercial consumers and small industrial customers) typically pay such taxes in full, while larger industrial consumers in some sectors may benefit from various discounts or exemptions. The level of these

exemptions depends on various factors (e.g. net energy consumption, energy intensity, exposure to international competition, overall consumption profile), and exemptions are usually not harmonized at the EU level.

3 The “IG consumption band”, according to European statistics nomenclature.

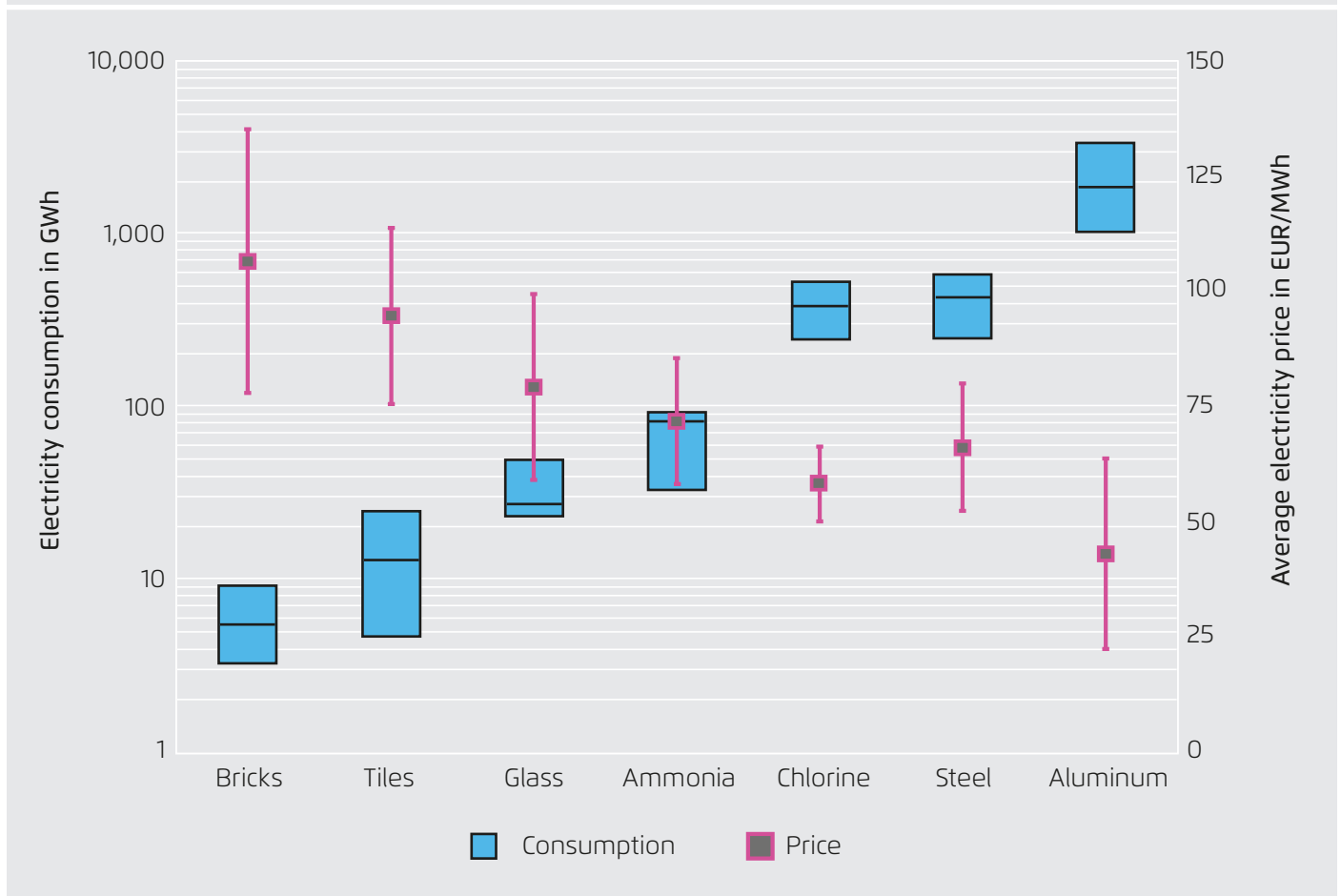
3 Case studies on German energy intensive industries and their European competitors

Current electricity price structures and trends have contributed to an increasing debate on European industrial competitiveness with respect to non-European countries (especially the US). Against the backdrop of decreasing wholesale prices in most European markets and increasing exemptions for specific industrial consumers, in 2013 the debate shifted. Stakeholders began directly comparing the electricity prices paid by several European energy-intensive industries, based on the concern that domestic regulations were

leading to market distortions and an unlevel playing field. Is there a basis for this concern? We address this issue below.

European energy statistics (as given by Eurostat) only provide average electricity prices within broad electricity consumption bands. This approach masks significant price differences within sectors, especially as energy-intensive consumers (150 GWh or above) are not systematically ta-

Figure 3 Electricity consumption range and price variation grouped by sectors



CEPS, European Commission (2014)

ken into account in official statistics and comparisons⁴. In a recent study, the European Commission attempted to bring more clarity to this issue, comparing explicitly the electricity prices paid by different energy-intensive industries across Europe⁵. The results, which were only partially released and based on data collected by questionnaire, show a wide range of prices between and within sectors (see Figure 3). For data confidentiality reasons, the study doesn't exhaustively and explicitly compare the situation between countries.

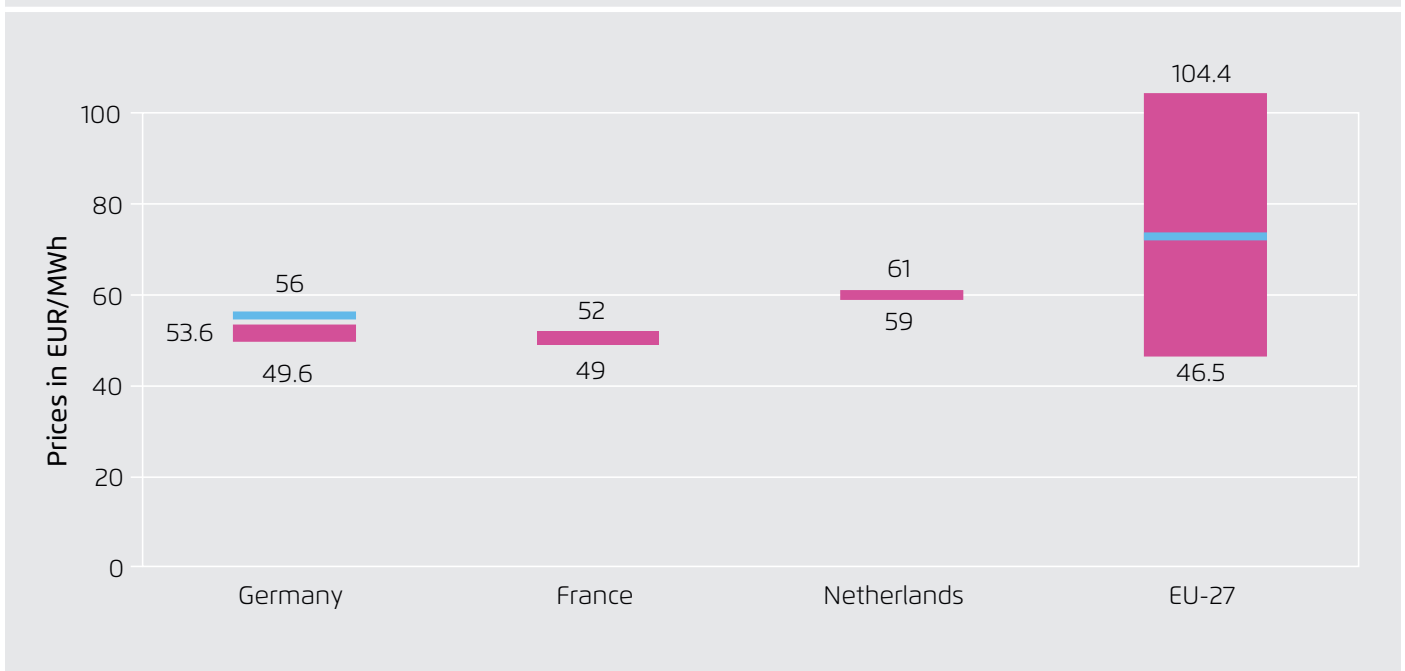
Several studies commissioned by public authorities or industrial federations have specifically compared the electricity prices paid in individual countries with the price paid

in Germany. For example, Figure 4 shows the results of two studies comparing 2012 end-use electricity prices in Germany, France and the Netherlands for an annual electricity consumption level of 150 GWh. For Germany, the studies estimate prices ranging from 49.6 to 56 euros/MWh, whereas French prices are stated to range from 49 to 52 euros/MWh. Significantly higher wholesale prices in the Netherlands (see Figure 1) are reflected in higher end-use price estimations ranging from 59 to 61 euros/MWh. Furthermore, Figure 4 gives the Commission's latest estimations for end-use prices paid by European steel producers, which range from 46.5 to 104.4 euros/MWh, and average at 71.4 euros/MWh. The results of these studies must be interpreted cautiously, given the lack of harmonized methodologies and transparent data.

In addition to comparing energy-intensive industries between countries, assessing different consumption classes yields interesting results. For example, according to a study

- 4 Electricity prices for the IG consumption band (annual consumption above 150 GWh) are not available for several countries, as the price data for this band are declared on a voluntary basis.
- 5 European Commission, 2014. Energy prices and costs report. Commission Staff Working Document, Brussels.

Figure 4: Comparison of end-use electricity prices in 2012 for energy intensive industries (150 GWh annual consumption)



German prices : adapted from PwC 2014, French Economic Ministry 2013; French prices : French Economic Ministry 2013; Dutch prices : adapted from PwC 2014; EU-27 prices : EC 2014 (blue line : average price)

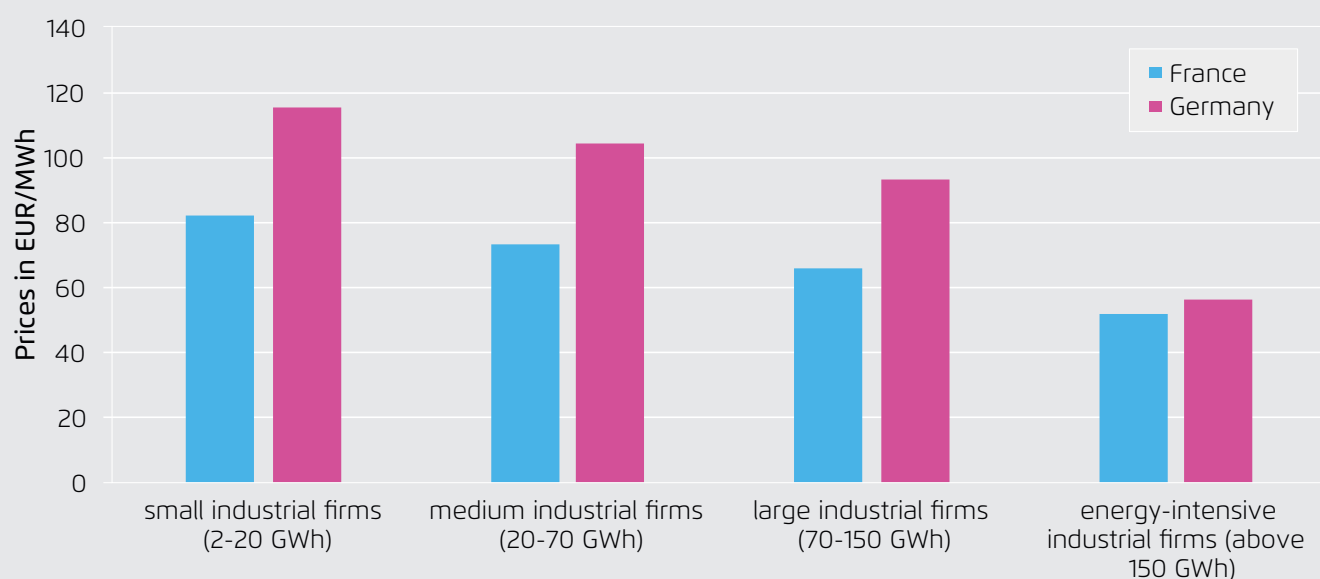
of the French Ministry of Economics,⁶ in 2012 the vast majority of German companies paid a higher price for electricity than their French counterparts, although this price differential decreased with increasing consumption levels (see Figure 5). Yet especially given the higher level of tax exemptions for large industrial consumers in Germany in comparison to France, the electricity price paid by large energy-intensive firms is actually rather comparable in the two countries. According to the cited study, the decline in wholesale electricity prices since 2013 has tended to give large German power-intensive industries a competitive advantage over their French counterparts. Nevertheless, exposure to market prices is much higher in Germany than in France. Consequently, and according to a study by the French Energy Regulator (CRE), the comparative advantage shifts

to the benefit of French industry whenever the market price for electricity is higher than 46.5 euros/MWh.⁷

6 Comparaison des prix de l'électricité en France et en Allemagne, DG Trésor, November 2013

7 Analyse de la compétitivité des entreprises intensives en énergie: comparaison France-Allemagne – CRE – June 2013

Figure 5 Comparison of end-use industrial electricity prices in Germany and France in 2012



DG Trésor (2014)

4 Conclusion

Global and regional macroeconomic trends have fanned heated debate concerning the competitiveness of Europe's energy-intensive industries. The cost of energy is a prominent element in this debate, though arguably other factors (e.g. innovation, R&D, workers' skills) are equally important when it comes to assessing the overall competitiveness of an industry. While the current political debate has typically revolved around competitiveness between European countries and the rest of the world, many have also drawn attention to the supposed lack of a level playing field between member states (as seen, for example, in the investigation launched by the Commission into the exemption from the renewables surcharge granted to energy-intensive German industries).

As highly energy-intensive industries typically receive exemptions from grid tariffs and renewable energy levies, comparing wholesale market prices can serve as a starting point for assessing differences in energy cost structures. Our analysis has highlighted that European wholesale spot prices have been on the decline (mainly due to increased renewable power generation, low coal and CO₂ prices and stagnant or slightly declining demand levels). By contrast, US spot prices have been on the rise (mainly due to rising gas prices). In 2013, spot electricity prices within the European Union were lowest in the Czech Republic, Germany and Poland.

Due to differences in the purchasing and hedging strategies employed by energy-intensive industrial customers, wholesale spot prices may not accurately reflect the cost of electricity purchased by these industries. Long-term contracts or the existence of regulated prices in some countries make direct comparisons particularly difficult. These conditions, enhanced by a lack of transparent statistics on energy-intensive industrial end-use prices, underline the elusiveness of a "fair" comparison of energy costs between countries.

5 References

CRE (2013): Analyse de la compétitivité des entreprises intensives en énergie : comparaison France-Allemagne, June 2013.

DG Trésor (2013): Comparaison des prix de l'électricité en France et en Allemagne, November 2013.

European Commission (2014): Energy prices and costs report. Commission Staff Working Document, Brussels.

PwC, 2013. Prijsvergelijk elektriciteit Nederland – Duitsland, Advisory Ministerie van Economische Zaken, October 2013.

6 Annex

Table 1: Average yearly wholesale prices (spot market, baseload) in several EU countries.

EUR/MWh	DE-AT	NL	FR	CH	PL	BE	CZ	UK	PT	ES	Nord Pool	IT
2010	44.46	45.35	47.47		49.31	46.28			37.33	37.01	53.06	64.12
2011	51.12	52.06	48.89	56.18	49.82	49.41	50.56		50.45	49.93	47.05	72.23
2012	42.6	48.05	46.94	49.52	42.88	46.98	42.38	54.46	48.07	47.23	31.2	75.48
2013	37.78	51.95	43.24	44.73	37.31	47.45	36.74	61.60	43.65	44.26	38.1	62.96

Power exchanges, own calculations

Table 2: Average yearly wholesale prices (weekday prices from 7AM to 11PM) on selected US spot markets.

EUR/MWh	PJM West	NYISO	MISO	ERCOT	CAISO
2010	42.00			33.06	31.63
2011	38.53	47.72	28.89	47.12	27.91
2012	32.51	37.68	25.94	29.05	25.66
2013	35.40	49.09	28.02	29.97	34.43

Power exchanges, own calculations

Publications by Agora Energiewende

IN ENGLISH

12 Insights on Germany's Energiewende

An Discussion Paper Exploring Key Challenges for the Power Sector

A radically simplified EEG 2.0 in 2014

Concept for a two-step process 2014-2017

Benefits of Energy Efficiency on the German Power Sector

Final report of a study conducted by Prognos AG and IAEW

Comparing Electricity Prices for Industry

An elusive task – illustrated by the German case

Comparing the Cost of Low-Carbon Technologies: What is the Cheapest Option?

An analysis of new wind, solar, nuclear and CCS based on current support schemes in the UK and Germany

Cost Optimal Expansion of Renewables in Germany

A comparison of strategies for expanding wind and solar power in Germany

Load Management as a Way of Covering Peak Demand in Southern Germany

Final report on a study conducted by Fraunhofer ISI and Forschungsgesellschaft für Energiewirtschaft

Report on the Polish power system

Version 1.0

The German Energiewende and its Climate Paradox

An Analysis of Power Sector Trends for Renewables, Coal, Gas, Nuclear Power and CO₂ Emissions, 2010-2030

IN GERMAN

12 Thesen zur Energiewende

Ein Diskussionsbeitrag zu den wichtigsten Herausforderungen im Strommarkt (Lang- und Kurzfassung)

Brauchen wir einen Kapazitätsmarkt?

Dokumentation der Stellungnahmen der Referenten der Diskussionsveranstaltung am 24. August 2012 in Berlin

Das deutsche Energiewende-Paradox. Ursachen und Herausforderungen

Eine Analyse des Stromsystems von 2010 bis 2030 in Bezug auf Erneuerbare Energien, Kohle, Gas, Kernkraft und CO₂-Emissionen

Die Zukunft des EEG – Evolution oder Systemwechsel?

Dokumentation der Stellungnahmen der Referenten der Diskussionsveranstaltung am 13. Februar 2013 in Berlin

Ein radikal vereinfachtes EEG 2.0 und ein umfassender Marktdesign-Prozess

Konzept für ein zweistufiges Verfahren 2014-2017

Publications by Agora Energiewende

Ein robustes Stromnetz für die Zukunft

Methodenvorschlag zur Planung – Kurzfassung einer Studie von BET Aachen

Entwicklung der Windenergie in Deutschland

Eine Beschreibung von aktuellen und zukünftigen Trends und Charakteristika der Einspeisung von Windenergieanlagen

Erneuerbare Energien und Stromnachfrage im Jahr 2022

Illustration der anstehenden Herausforderungen der Energiewende in Deutschland. Analyse auf Basis von Berechnungen von Fraunhofer IWES

Kapazitätsmarkt oder Strategische Reserve: Was ist der nächste Schritt?

Eine Übersicht über die in der Diskussion befindlichen Modelle zur Gewährleistung der Versorgungssicherheit in Deutschland

Kostenoptimaler Ausbau der Erneuerbaren Energien in Deutschland

Ein Vergleich möglicher Strategien für den Ausbau von Wind- und Solarenergie in Deutschland bis 2033

Lastmanagement als Beitrag zur Deckung des Spitzenlastbedarfs in Süddeutschland

Endbericht einer Studie von Fraunhofer ISI und der Forschungsgesellschaft für Energiewirtschaft

Positive Effekte von Energieeffizienz auf den deutschen Stromsektor

Endbericht einer Studie von der Prognos AG und dem Institut für Elektrische Anlagen und Energiewirtschaft (IAEW)

Kritische Würdigung des Netzentwicklungsplanes 2012

Kurzstudie des Büros für Energiewirtschaft und technische Planung (BET)

Reform des Konzessionsabgabenrechts

Gutachten vorgelegt von Raue LLP

Steigende EEG-Umlage: Unerwünschte Verteilungseffekte können vermindert werden

Analyse des Deutschen Instituts für Wirtschaftsforschung (DIW)

Strommarktdesign im Vergleich: Ausgestaltungsoptionen eines Kapazitätsmarkts

Dokumentation der Stellungnahmen der Referenten für die Diskussionsveranstaltung am 10. Juni 2013 in Berlin

Stromverteilnetze für die Energiewende

Empfehlungen des Stakeholder-Dialogs Verteilnetze für die Bundesrepublik – Schlussbericht

Vergütung von Windenergieanlagen an Land über das Referenzertragsmodell

Vorschlag für eine Weiterentwicklung des Referenzertragsmodells und eine Anpassung der Vergütungshöhe

Vorschlag für eine Reform der Umlage-Mechanismen im Erneuerbare Energien Gesetz (EEG)

Studie des Öko-Instituts im Auftrag von Agora Energiewende

Wie wird sich die Windenergie in Deutschland weiterentwickeln?

Dokumentation der Diskussion zur Kurzstudie Entwicklung der Windenergie in Deutschland am 5. Juli 2013

Zusammenhang von Strombörsen und Endkundenpreisen

Studie von Energy Brainpool

How do we accomplish the Energiewende? Which legislation, initiatives, and measures do we need to make it a success? Agora Energiewende helps to prepare the ground to ensure that Germany sets the course towards a fully decarbonised power sector. As a think-&-do-tank, we work with key stakeholders to enhance the knowledge basis and facilitate convergence of views.



Agora Energiewende

Rosenstraße 2 | 10178 Berlin

T +49 (0)30 284 49 01-00

F +49 (0)30 284 49 01-29

www.agora-energiewende.org

info@agora-energiewende.de

