Facts and Figures About the German Energy Transition
April 2015

The German Energy Transition: Debating Implications for New York State

In energy policy circles, few topics are more controversial than Germany's ambitious "energy transition" (*Energiewende*) away from fossil and nuclear energy. As New York pushes forward with its "Reforming the Energy Vision," which aims, among other things, to green the State's electricity system, it's worth revisiting the debate.

Renewable energy advocates tend to paint the *Energiewende* as a shining example for other countries and states to follow. To them, the dramatic growth of renewable energy in Germany proves that with appropriate policy tools, industrialized nations can markedly reduce the carbon intensity of their energy systems without jeopardizing the well-being of their economies or electricity networks.

But many others, including utility industry representatives and their allies, argue that the *Energiewende* is a cautionary tale. They note that as the *Energiewende* has accelerated retail electricity prices have soared, utilities' market capitalizations have plummeted, and greenhouse gas emissions have remained more or less constant. The rapid expansion of renewable energy is usually cited as the culprit; the Indiana senator Dan Coats, for example, has said that the *Energiewende* demonstrates that we should "simply let[] proven energy providers do their jobs and produce energy."[1]

To help us sort through these competing narratives and decide for ourselves what lessons New York can draw from the *Energiewende*, the Guarini Center has compiled a series of diagrams and charts that illustrate some basic information about the German electricity sector and how it compares to New York's. We have prepared the following materials:

1. A comparison of organization of the electricity sectors in Germany and New York. (Figure 1)
2. Graphs showing the growth of renewable energy production in Germany over the past two decades and the relative contribution of conventional versus renewable resources over a similar time period. (Figures 2 and 3)
3. Charts depicting the evolution of the feed-in tariff and the costs it has imposed on German consumers. (Figures 4 and 5)
4. A description of trends in natural gas, coal, and nuclear powered generation and market factors that may influence the growth of the former two. (Figures 6 through 8)
5. A comparison of wholesale and retail electricity prices in Germany and New York State. (Figures 9 through 11)

We hope that these visual aids will help to facilitate a highly productive conversation at the upcoming event.

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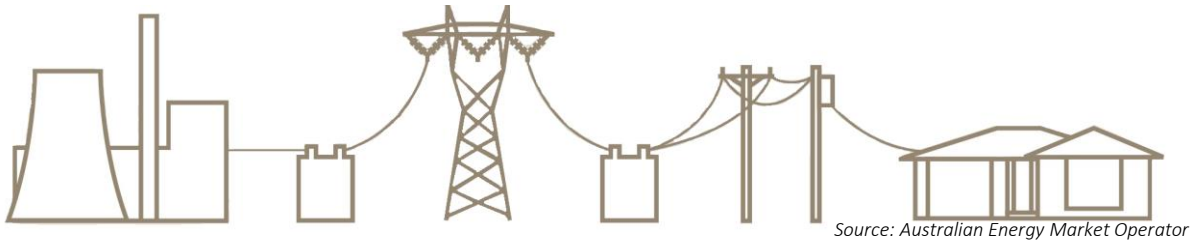
[1] Dan Coats, *What Obama Could Learn from Germany's Failed Experiment with Green Energy*, FOX NEWS, June 5, 2014 *available at* http://www.coats.senate.gov/newsroom/coats-column/coats-what-obama-could-learn-from-germanys-failed-experiment-with-green-energy

1. Industrial Organization of the Electricity Sectors in Germany and New York



Source: Australian Energy Market Operator

	Generation Facilities	Transmission Networks	Distribution Networks	Retail Segment
Germany	• Competitive market • Dominated by "Big Four" utilities, which also own distribution assets E.ON (private, German) EnBW (public, German) RWE (private, German) Vattenfall (public, Swedish)	• Four regional grids • Owned and operated by transmission system operators (TSOs) 50Hertz (private, Belgian) Amprion (private, German) TenneT (public, Dutch) TransnetBW (public, German)	• 869 local networks • Owned and operated by distribution system operators (DSOs) • "Big Four" hold ownership interests in many DSOs • Increasing trend toward municipal ownership	• Competitive market • Distribution utility is default provider
New York	• Competitive market • Dominated by private independent power producers • Generating companies are prohibited from owning network assets	• Single statewide grid operated by NYISO • Owned by six investor-owned utilities (IOUs) Central Hudson Con Edison National Grid NYSEG Orange & Rockland Rochester Gas & Electric	• Seven primary service territories • Owned and operated by six IOUs, the Long Island Power Authority (owned by the State, managed by PSEG), and 41 municipal utilities	• Competitive market • Distribution utility is default provider

Figure 1

Unlike New York's regulated utilities, which have been fully restructured since the late 1990s, German utilities maintain ownership interests in generation assets. As a result, German utilities bear greater exposure to factors that affect the profitability of generation.

2. The Growth of Renewable Energy in Germany

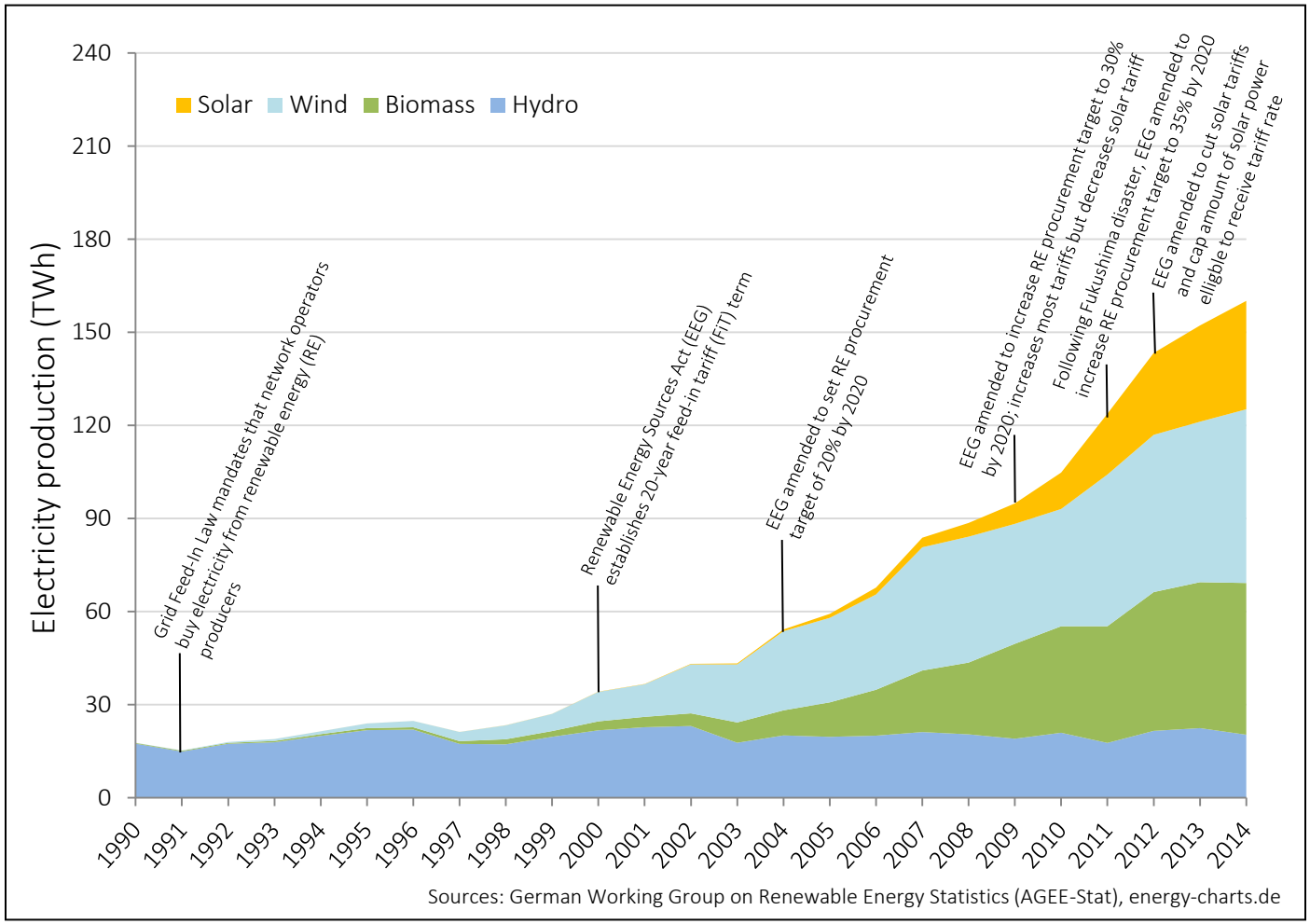


Figure 2

Wind remains the leading source of German renewable energy production; however, solar production has increased more than 60-fold since 2004. The breakneck growth of solar installations has caused concerns about market overheating and prompted policy adjustments designed to temper growth.

2. The Growth of Renewable Energy in Germany (continued)

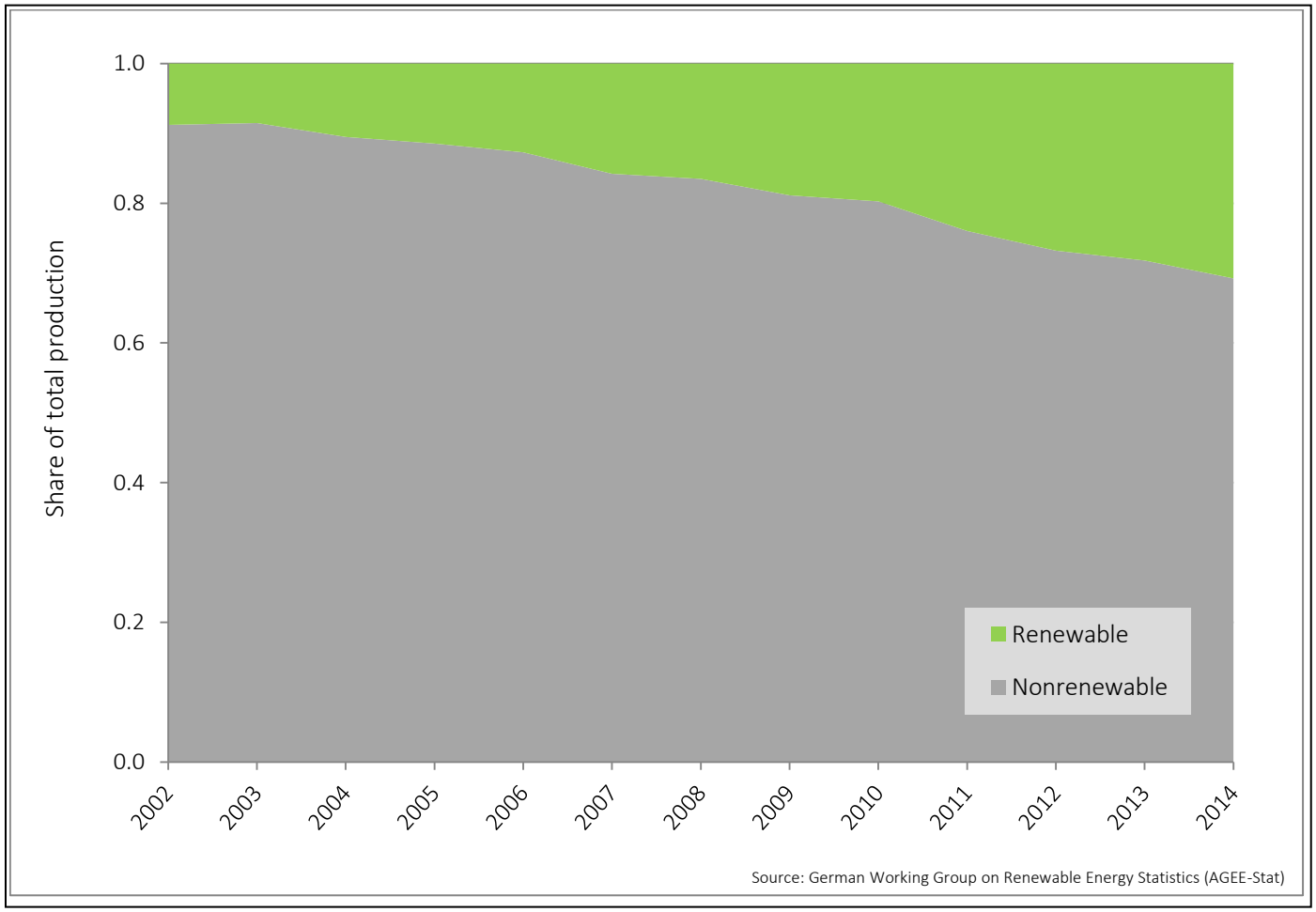


Figure 3

The renewable share of electricity production increased from under 10% in 2002 to roughly 30% in 2014; nonrenewable sources consist of coal, nuclear, and natural gas (see Figure 6 for details on the relative contribution made by each type of nonrenewable generation).

3. The Cost of Germany's Renewable Energy Policies

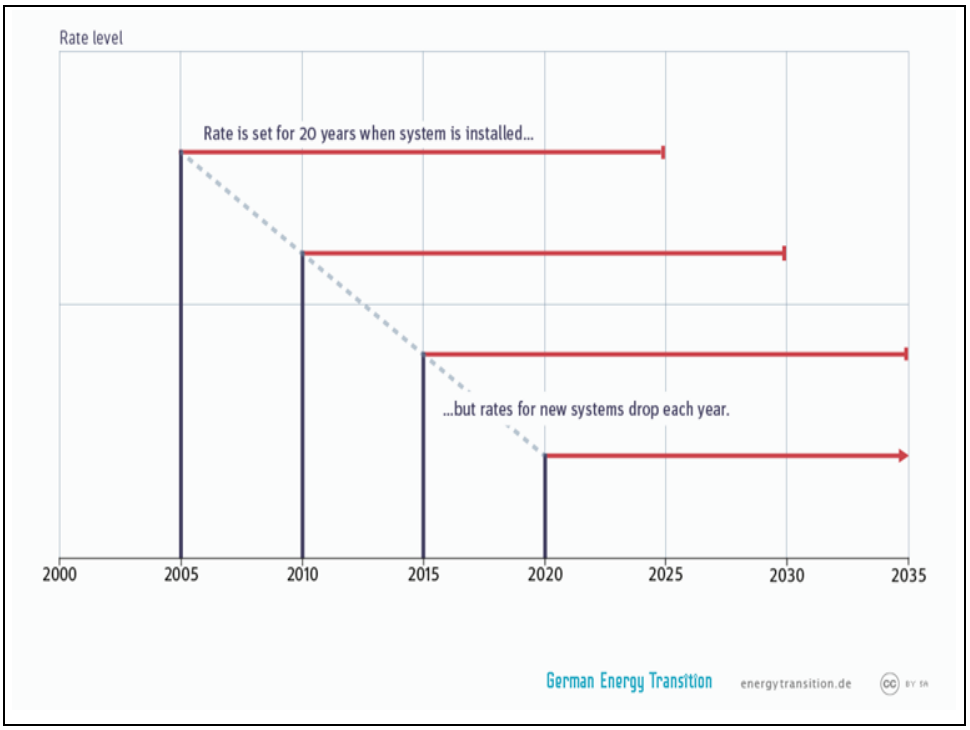


Figure 4

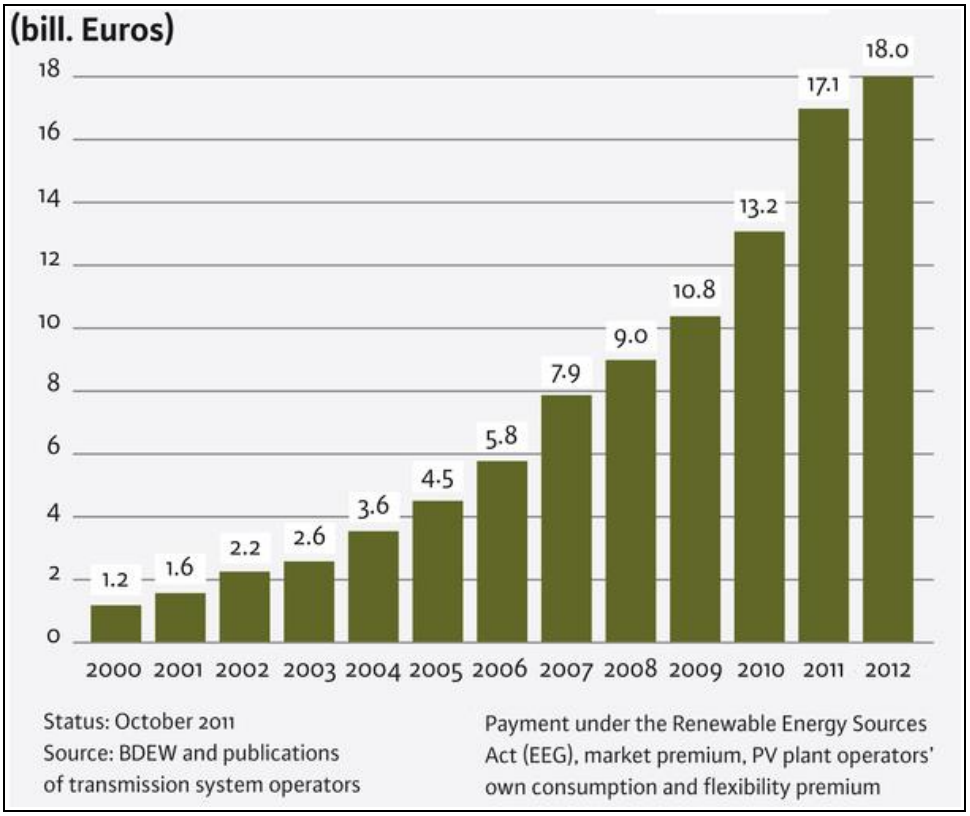


Figure 5

Under Germany's feed-in tariff (FiT), payments to RE producers are fixed for 20 years. However, rates for new systems fall each year to reflect declining costs (Figure 4).

In spite of these declining rates, aggregate payments to RE producers under the Renewable Energy Sources Act (EEG) have risen each year since 2000 due to the growing number of RE producers (Figure 5).

4. Electricity Production from Fossil Fuels and Nuclear

Coal production has grown relative to nuclear and natural gas in Germany since 2002.

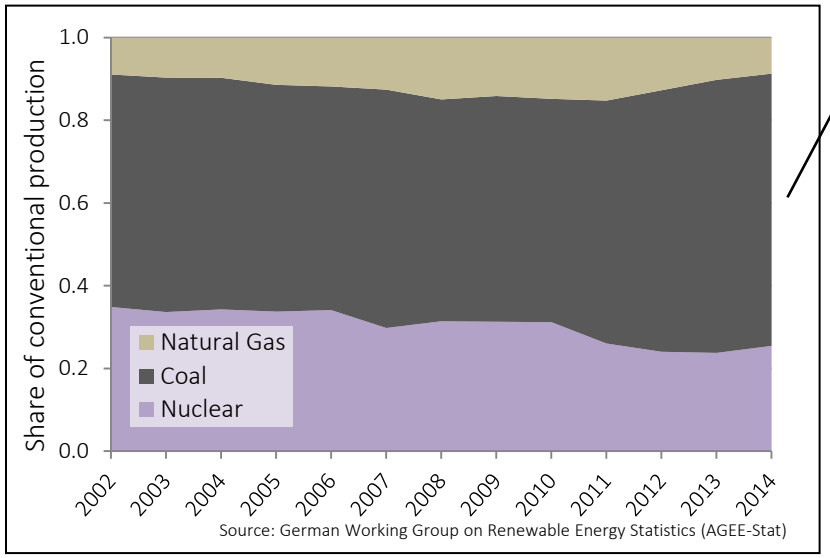


Figure 6

The decline of natural gas-fired generation in Germany can likely be attributed to increasing local natural gas prices.

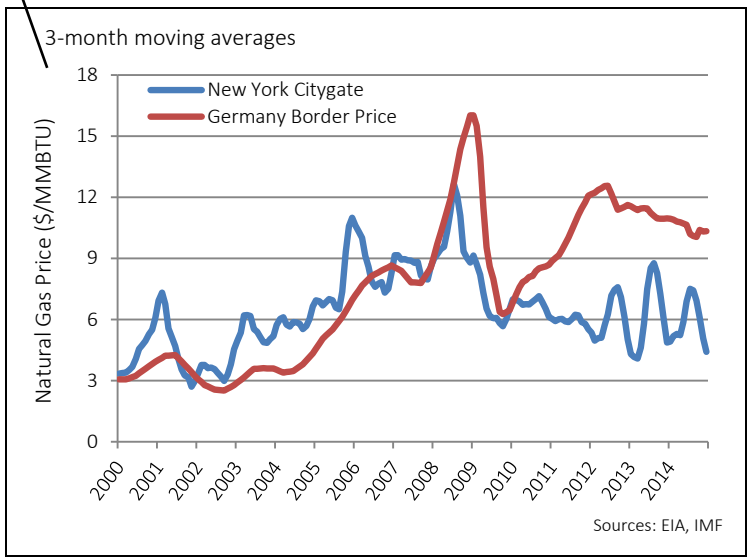


Figure 7

A portion of German electricity is produced to satisfy demand in neighboring countries. As such, a share of German emissions is attributable to foreign electricity consumption.

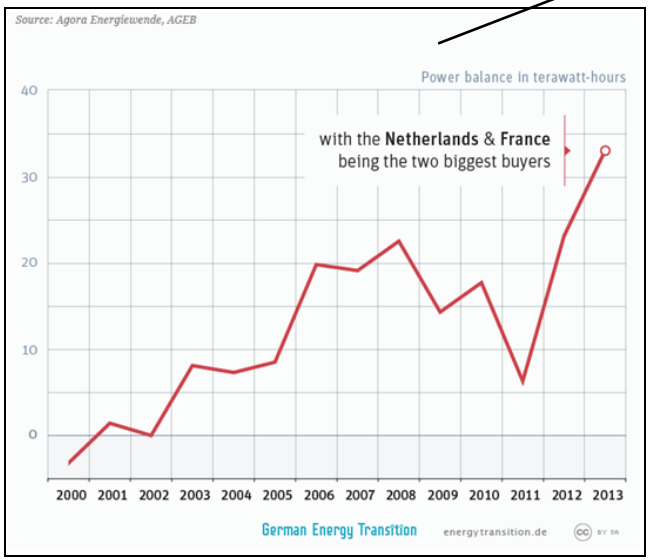


Figure 8

5. Electricity Prices in Germany and New York

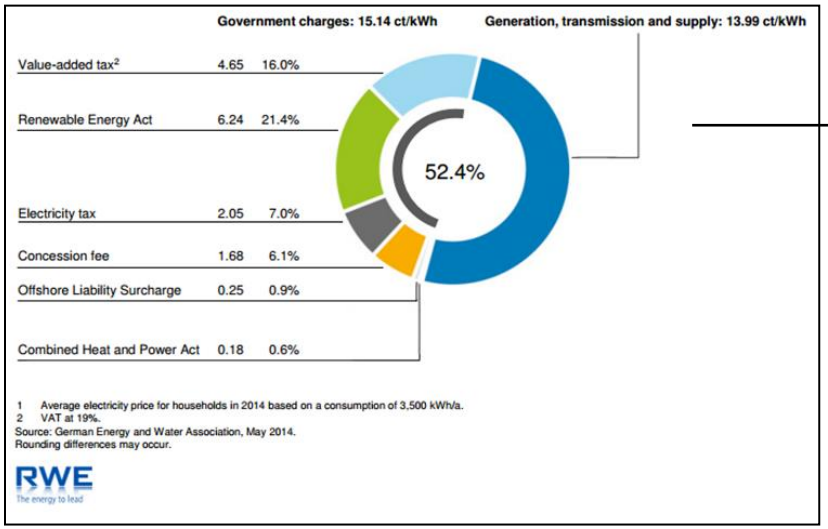


Figure 9

Government surcharges constitute 52.4% of an average German residential electricity bill as of May 2014.

The spread between retail and wholesale (spot) rates in Germany has grown significantly in recent years; the government renewable energy surcharge (see Figure 5) explains only a small portion of this spread.

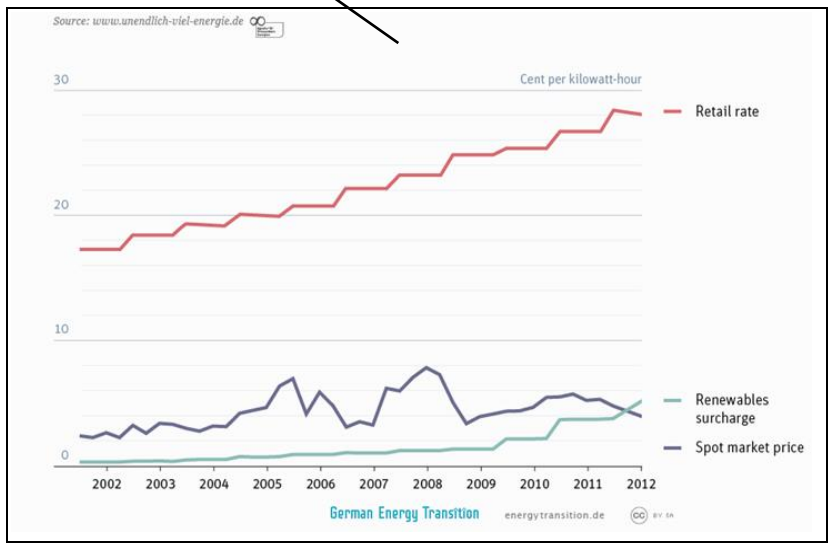


Figure 10

As in Germany, the spread between retail and wholesale rates in New York has increased, but remains smaller than in Germany.

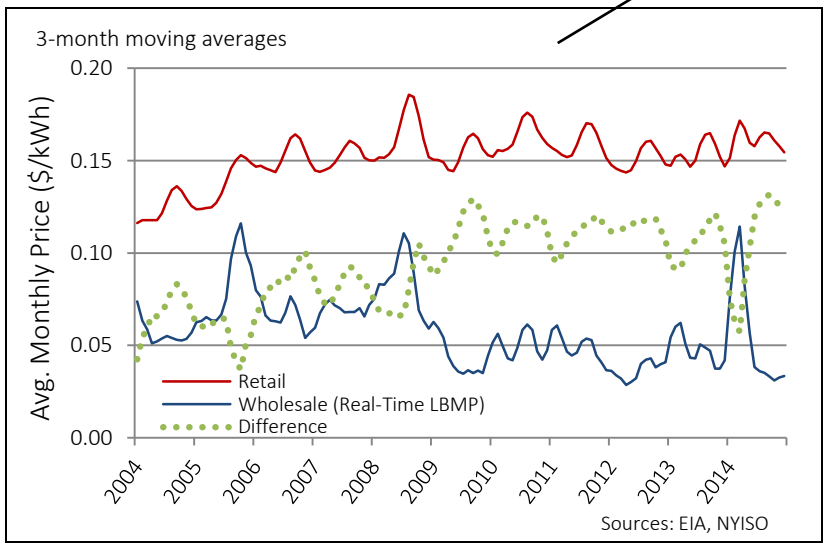


Figure 11