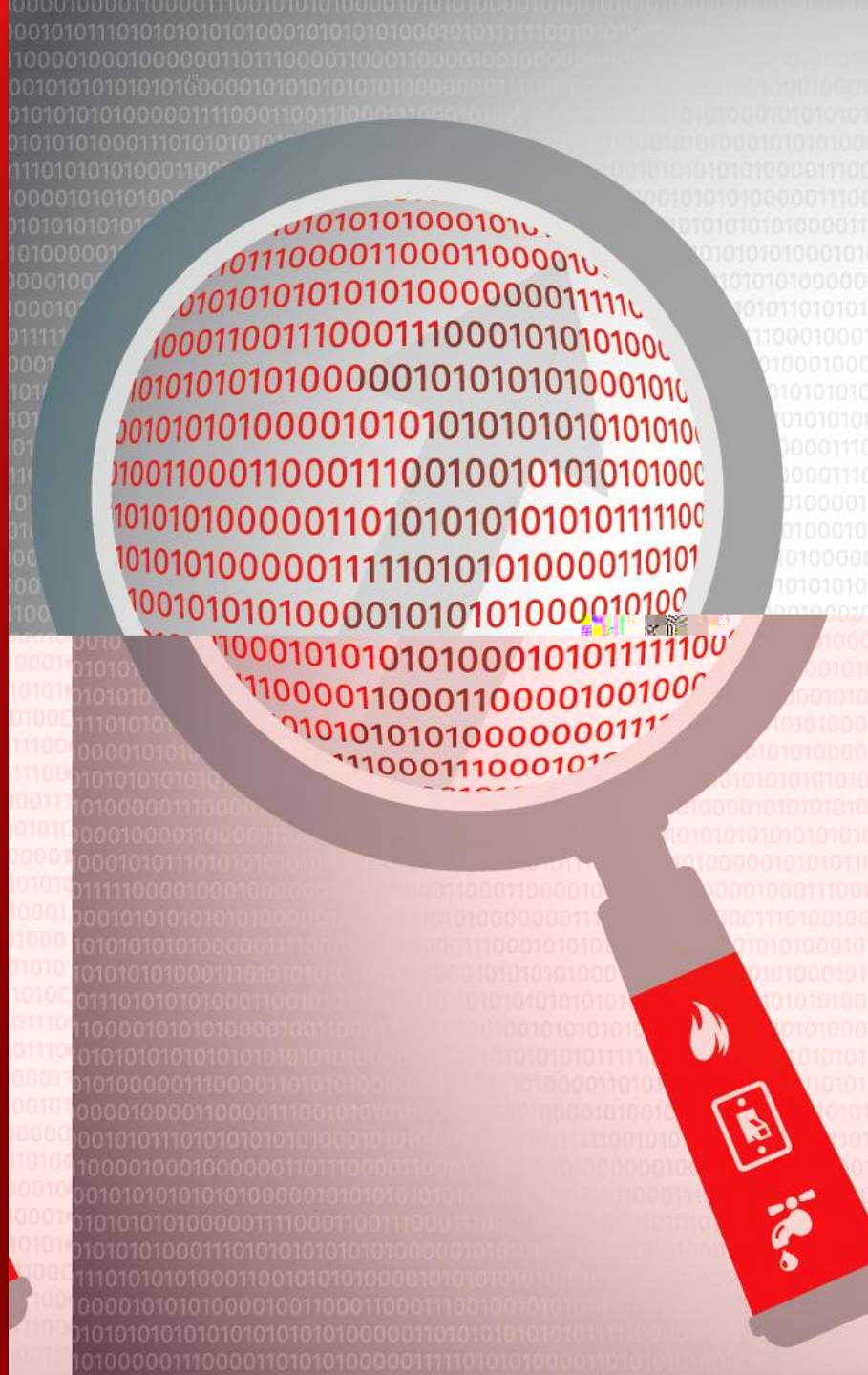
ORACLE

Operational Analytics for Utilities

Creighton Oyler
(creighton.oyler@oracle.com)

Patrick Steigler
(patrick.steigler@oracle.com)

April 15, 2014



Goals for today:

1. Arm you with information to intelligently discuss some key forces shaping the electric utilities industry

2. Deep dive into one example of technology at work in a real life setting

Why Bother Talking About Utilities

Utility industry behaviors will have a significant impact on the commercial success of any new energy-related product or service

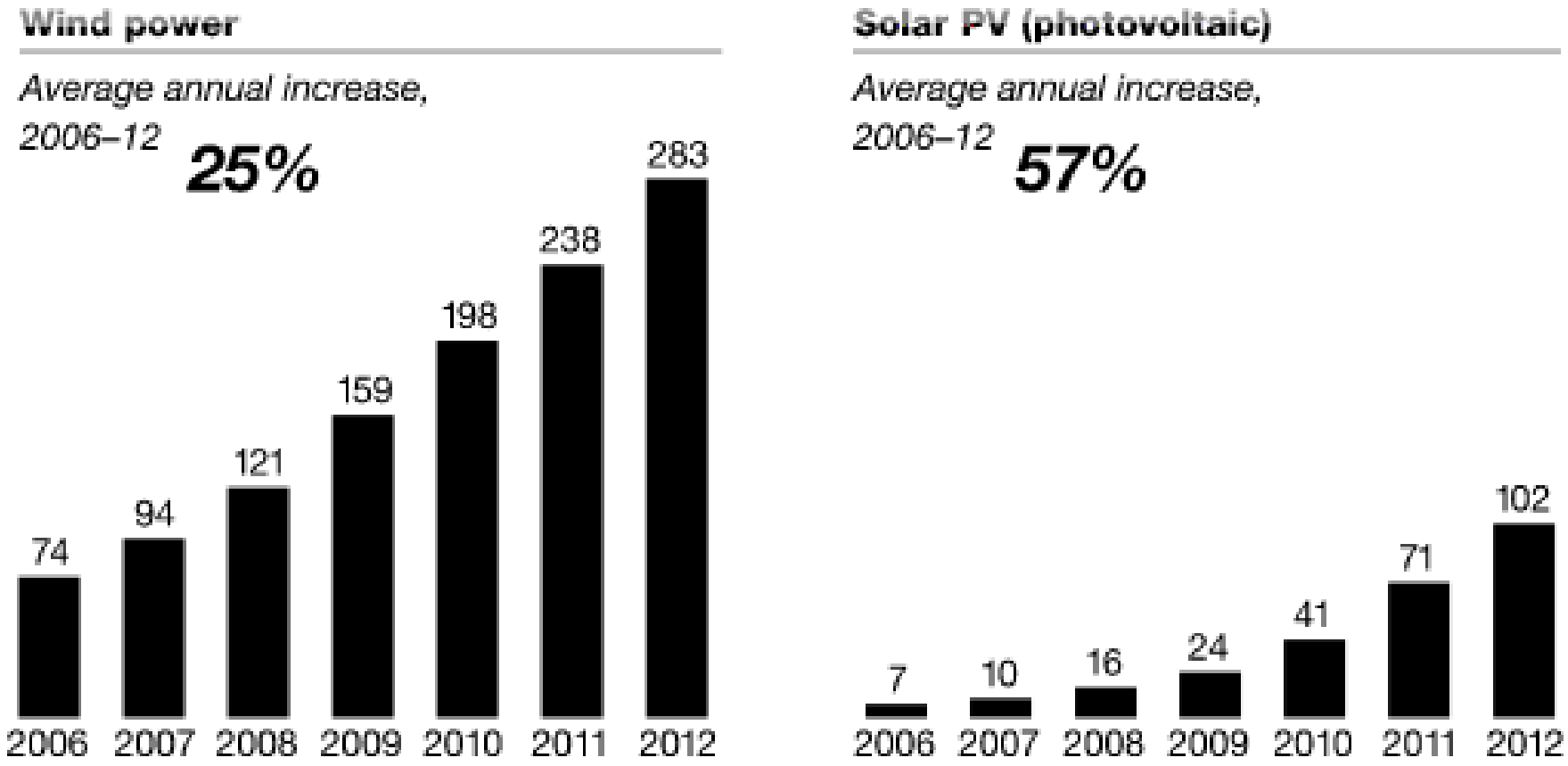
TRUE or FALSE?

Global regulation encouraging renewables adoption have been a success.

BY WHAT MEASURE?

Reliable, Safe, Clean, and Affordable…electricity

Installed Capacity



Source: Bloomberg; Thomson Reuters Datastream; Dow Jones; *Global Market Outlook for Photovoltaics 2013–2017*, European Photovoltaic Industry Association, May 2013; Factiva; Global Wind Energy Council

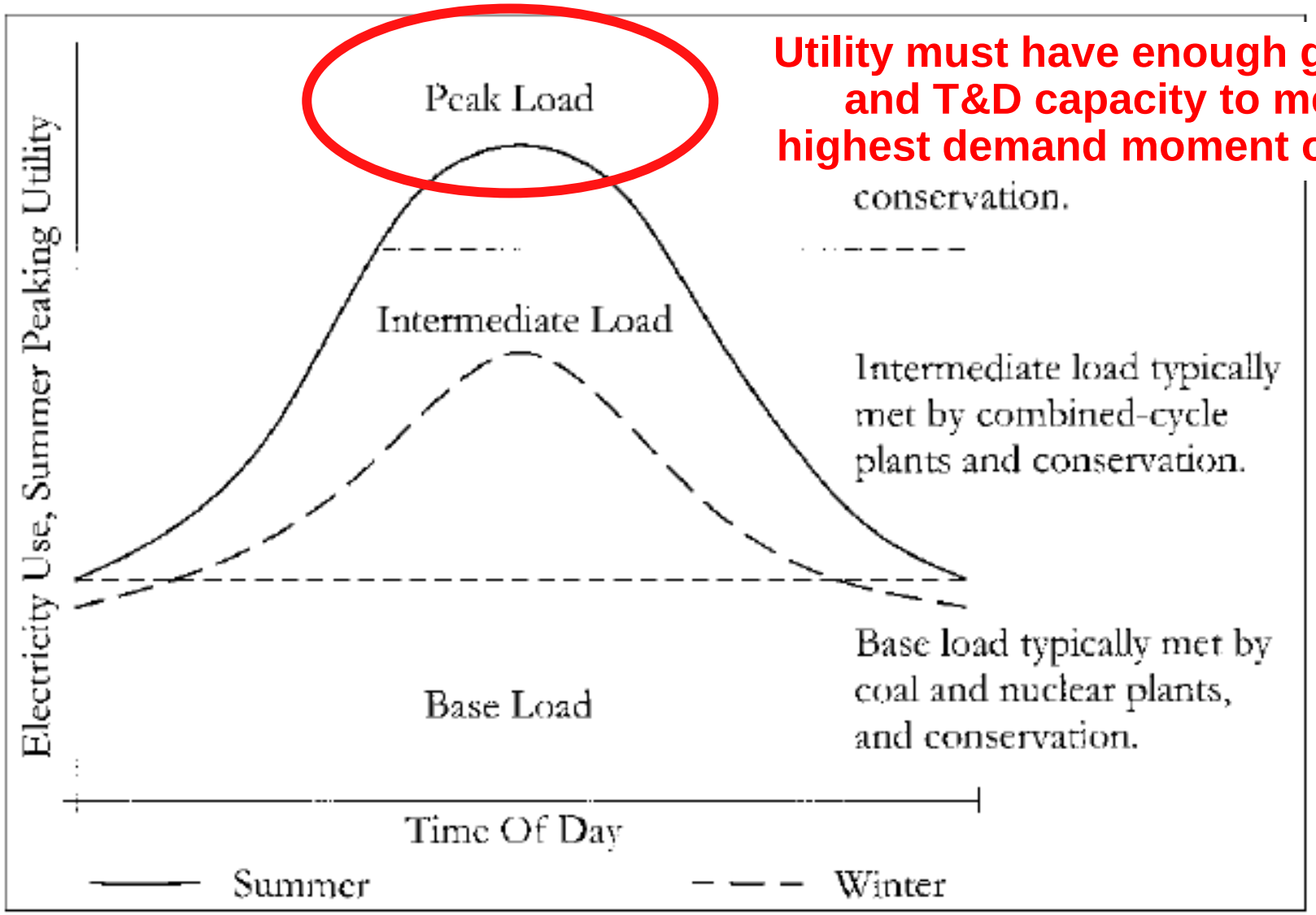
Agenda

- Industry Backdrop
- Euphemism City: “Revenue Protection”
- Q&A

Key Concepts

1. Peak
2. Rate Setting
3. Intermittency

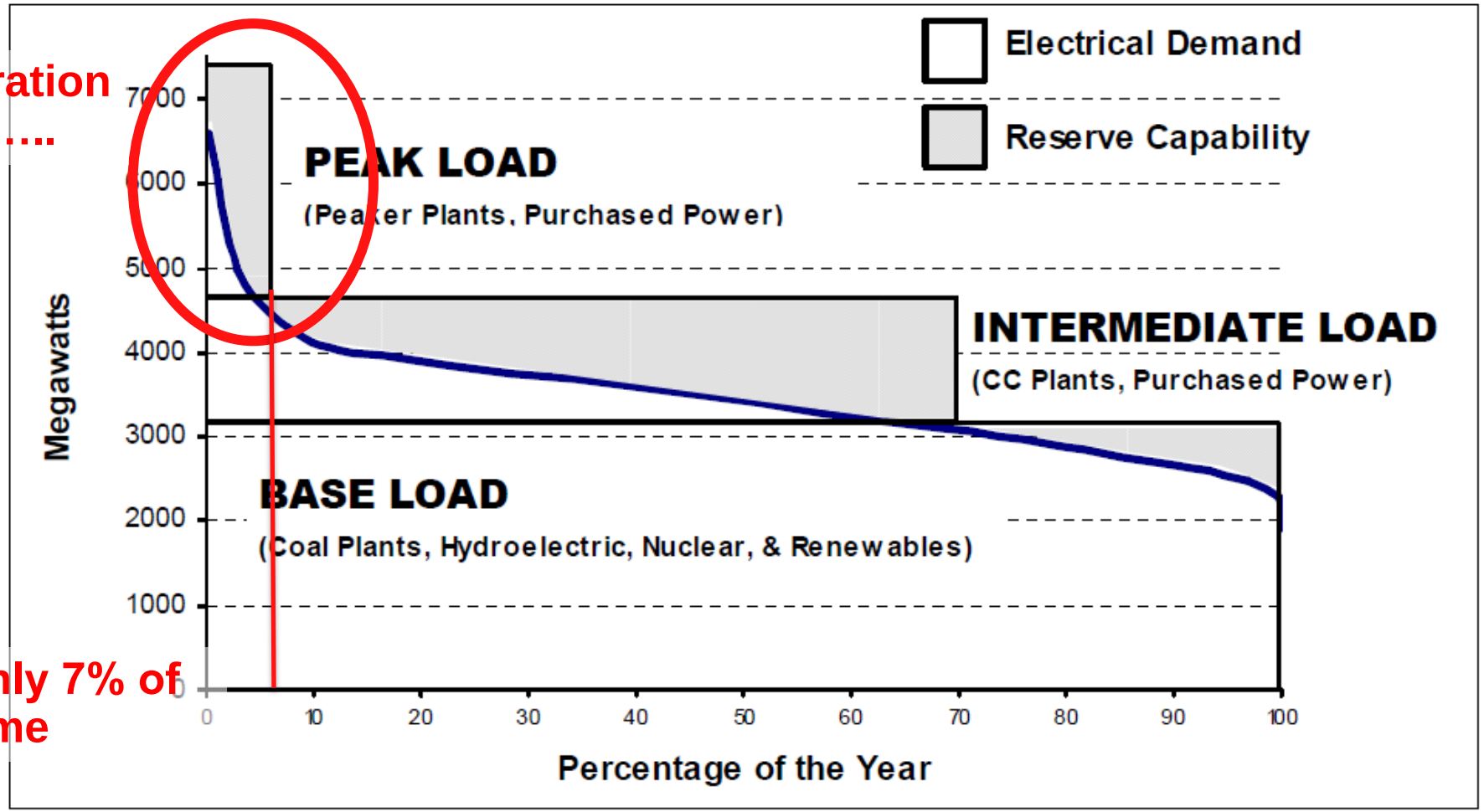
1. Peak Load Drives Infrastructure Sizing



Utility must have enough generation and T&D capacity to meet the highest demand moment of the year

1. So What's the Big Deal?

1/3 of generation capacity…..

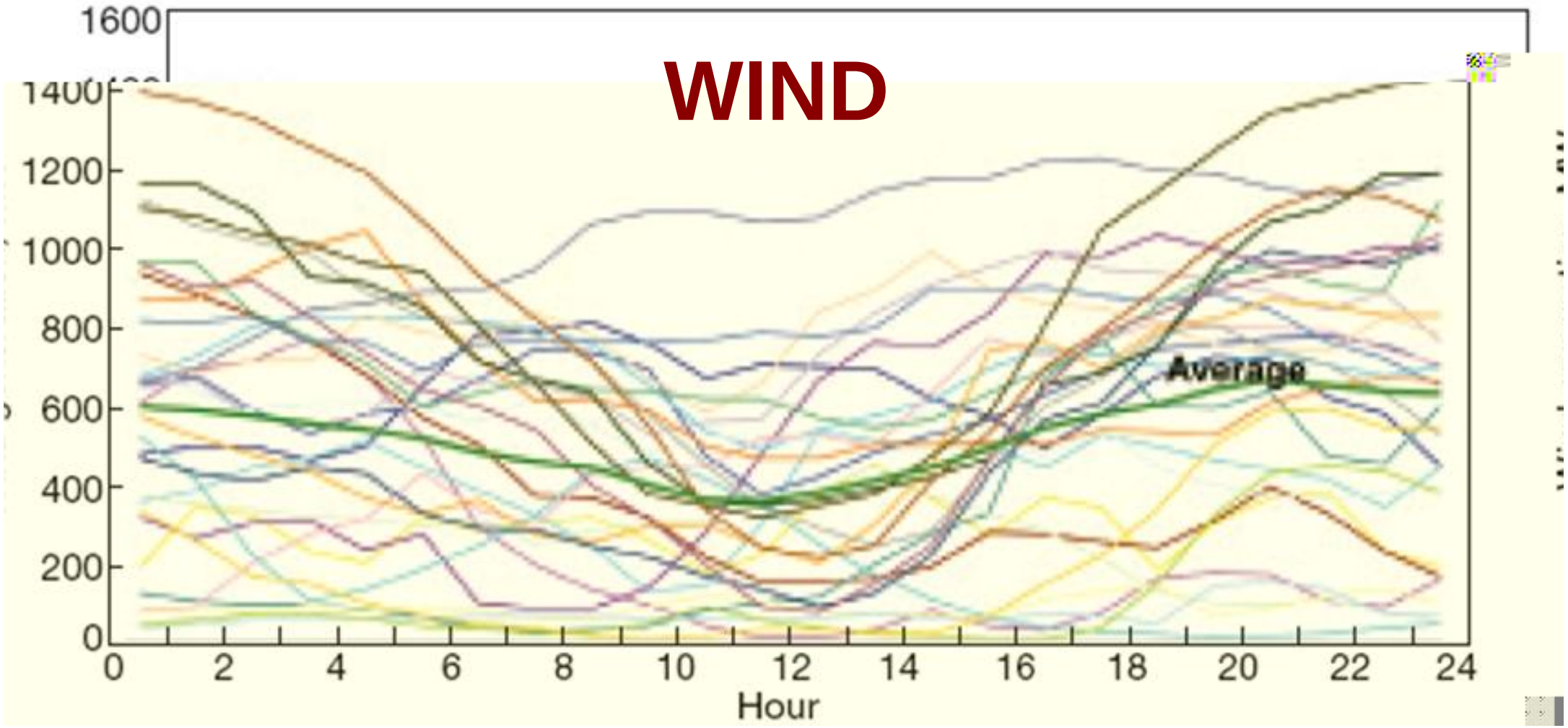


…utilized only 7% of the time

2. Basic View of Utility Rate Setting Mechanism

$$\frac{\text{Capital Base (\$)}}{\text{Annual Electric Consumption (kWh)}} = \text{Unit Price (\$/kWh)}$$

3. Renewables Intermittency



3. Renewables Intermittency

Recap

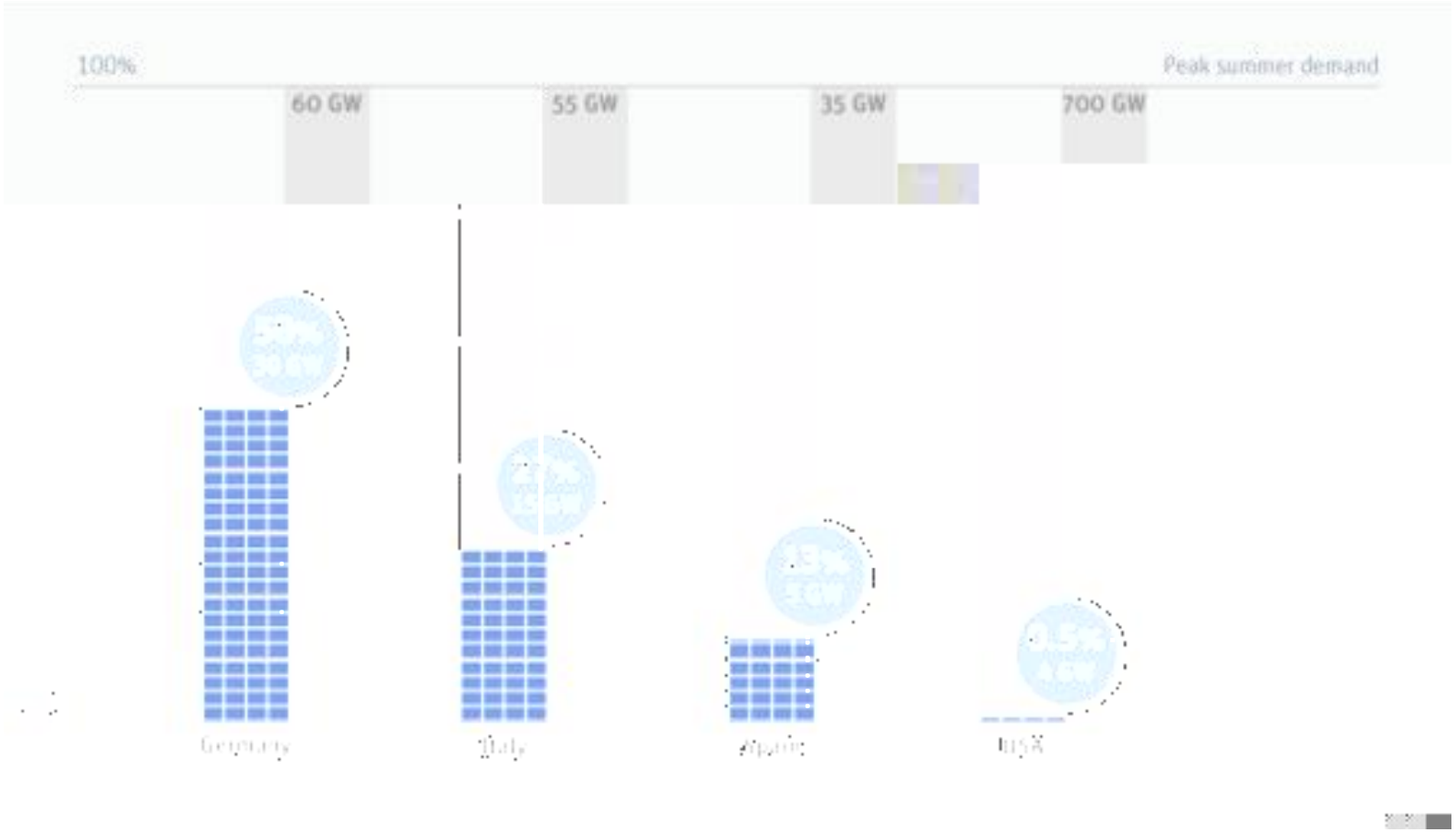
1. Electric infrastructure is sized for **peak periods**
2. Electric **rates** set to **allow for cost recovery** (plus profit)
3. Most **renewable generation** (less Hydro) **is intermittent**
4. **Batteries are not a cost-effective** option (yet) to solve intermittency
5. Utilities legally required to be **backup energy provider**

The dilemma

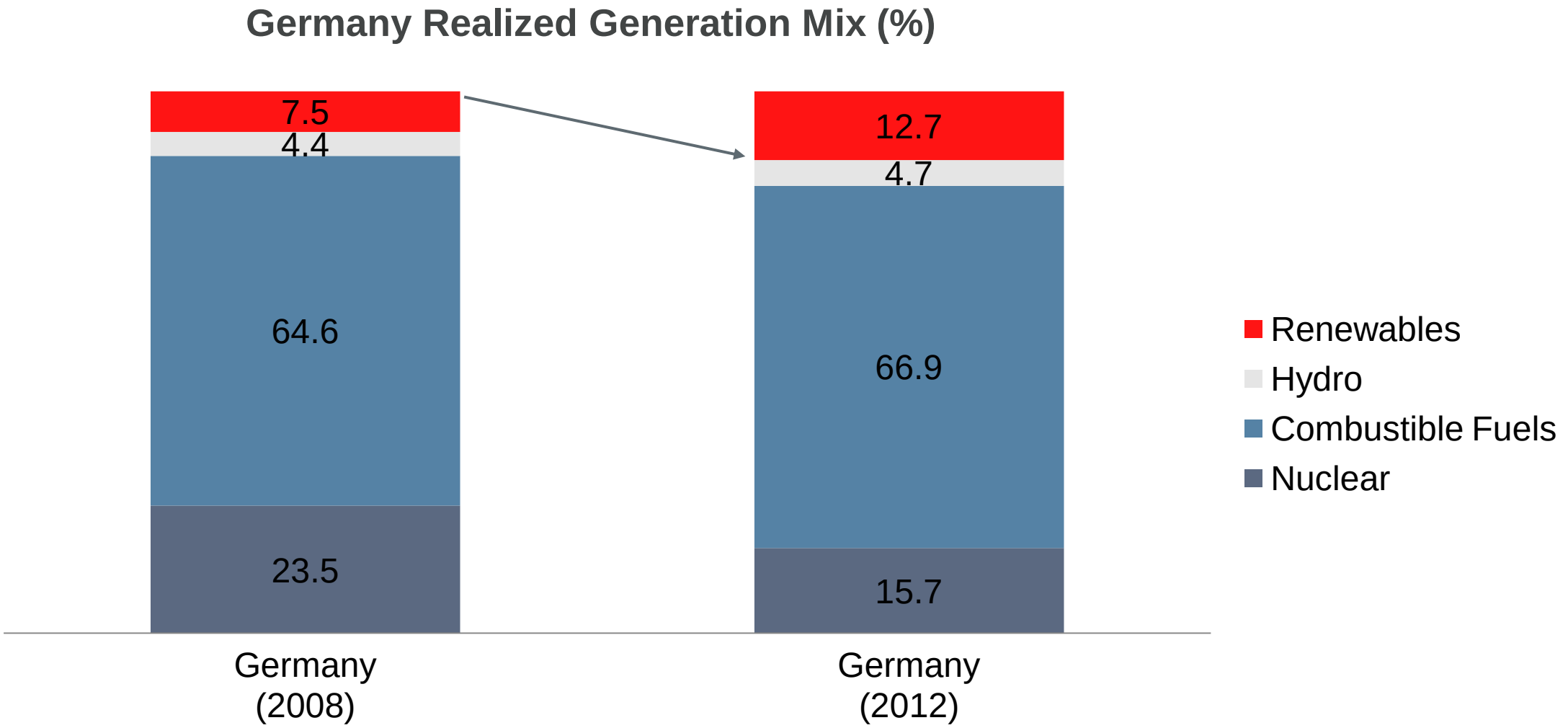
$$\frac{\text{Increased Costs}}{\text{Decreased kWh Consumed}} = \text{Higher Cost Per kWh}$$

Germany

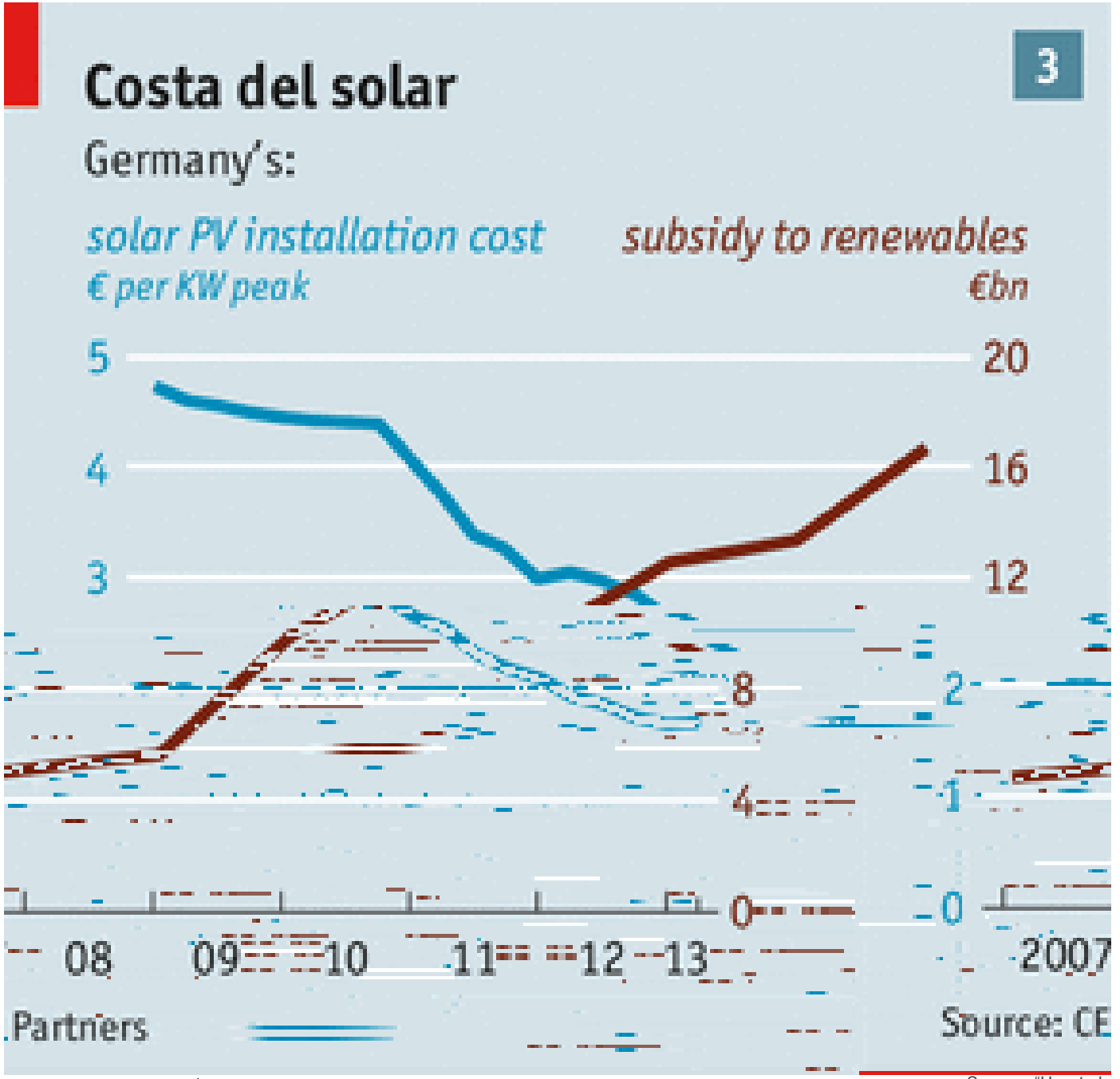
German Installed Solar Capacity Is Huge….



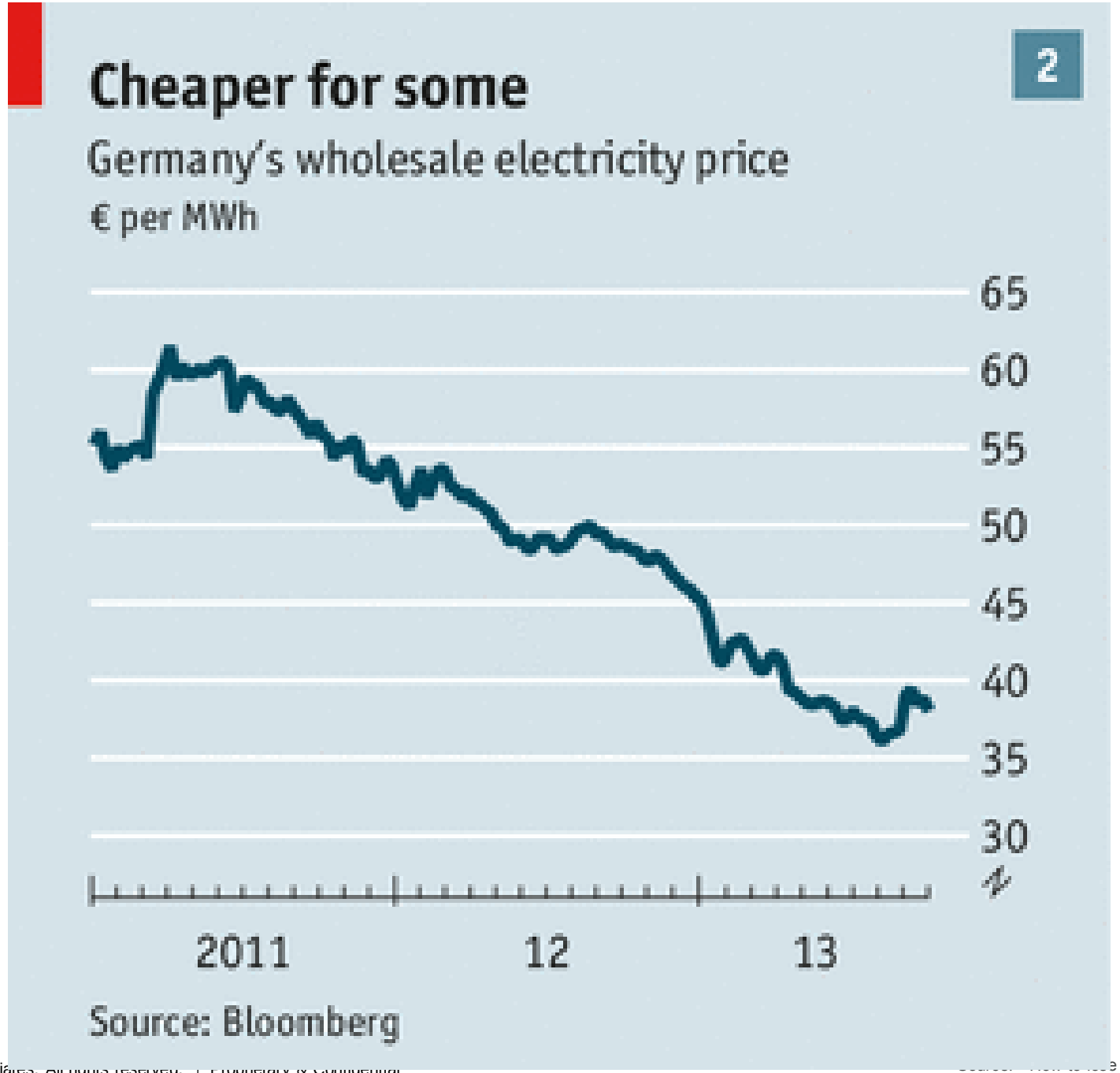
…But Still Just a Portion of Realized Generation



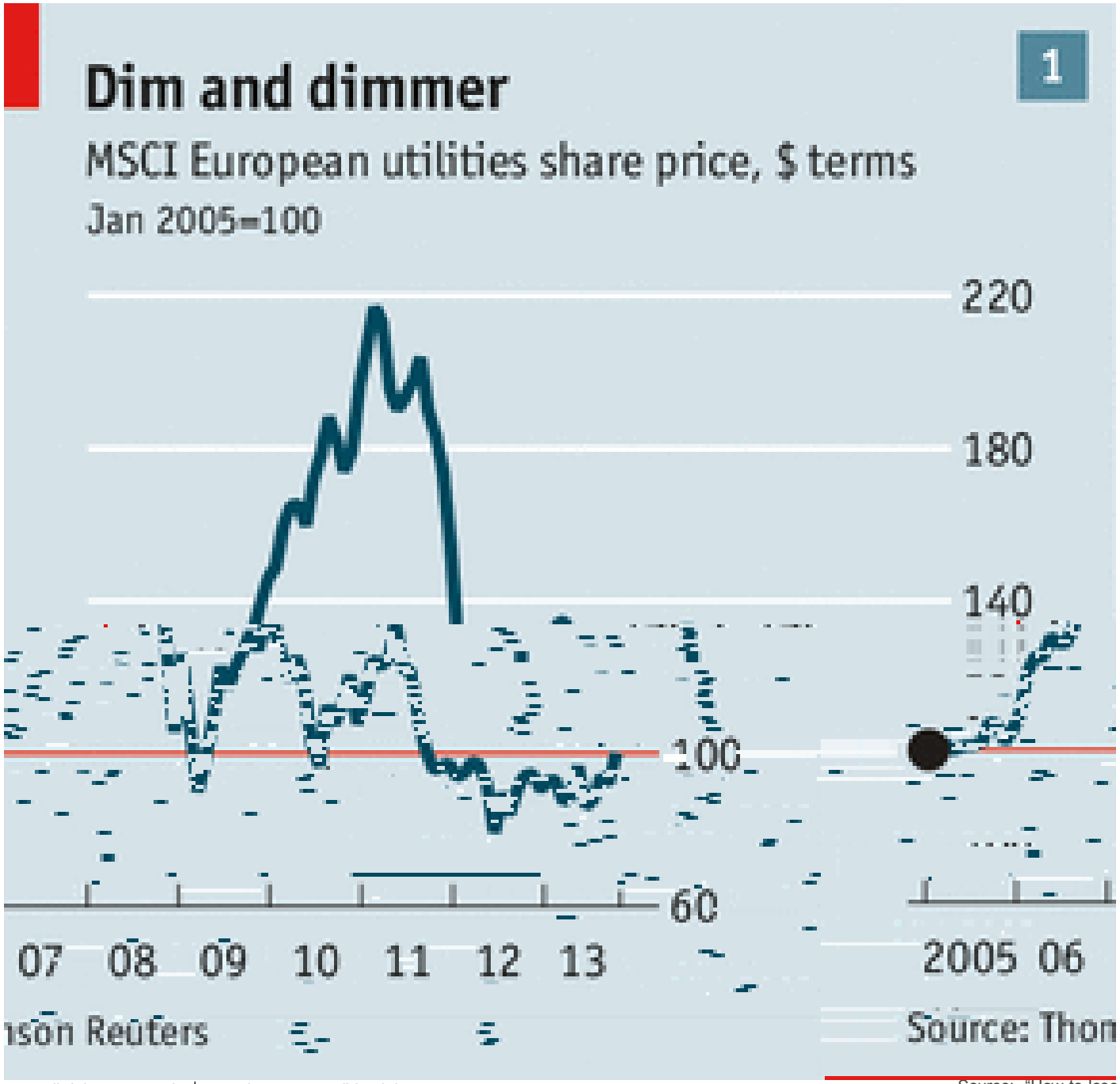
[a] Geothermal/Wind/Solar/Other
Source: International Energy Agency, Fitch



Source: "How to lose half a trillion euros." The Economist, October 12, 2013.



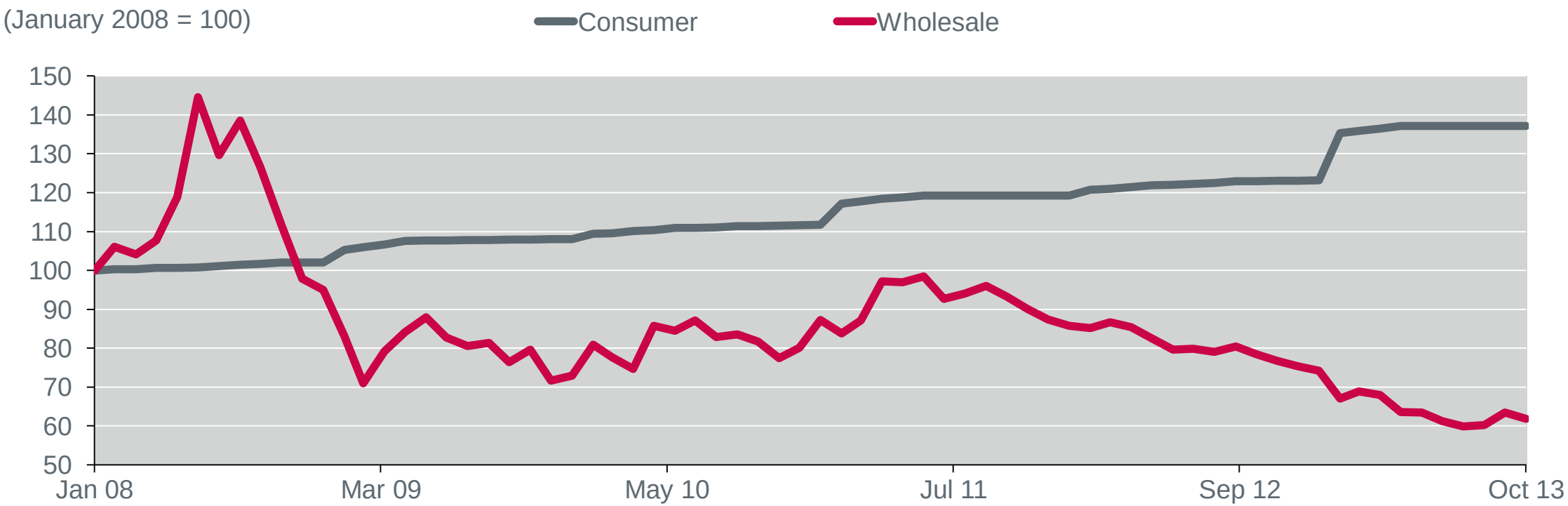
Source: "How to lose half a trillion euros." The Economist, October 12, 2013.



Source: "How to lose half a trillion euros." The Economist, October 12, 2013.

Customer Bills Rise While Utilities Earn Less

Electricity Prices in Germany
Normalised Consumer CPI vs. Wholesale Baseload



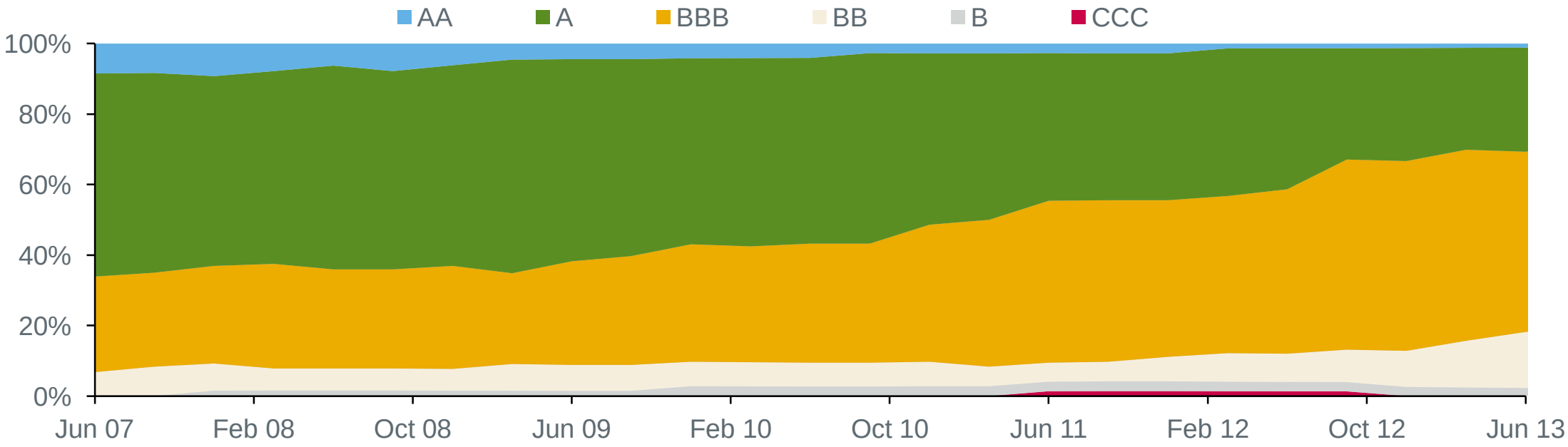
- **The rising bills include higher subsidies and network charges**
- **Utilities earn less in generation segment while supply margins remain modest**

Source: Bloomberg, Fitch

Credit Ratings of European Utilities

Historical Distribution of Ratings

EMEA utilities dynamic sample

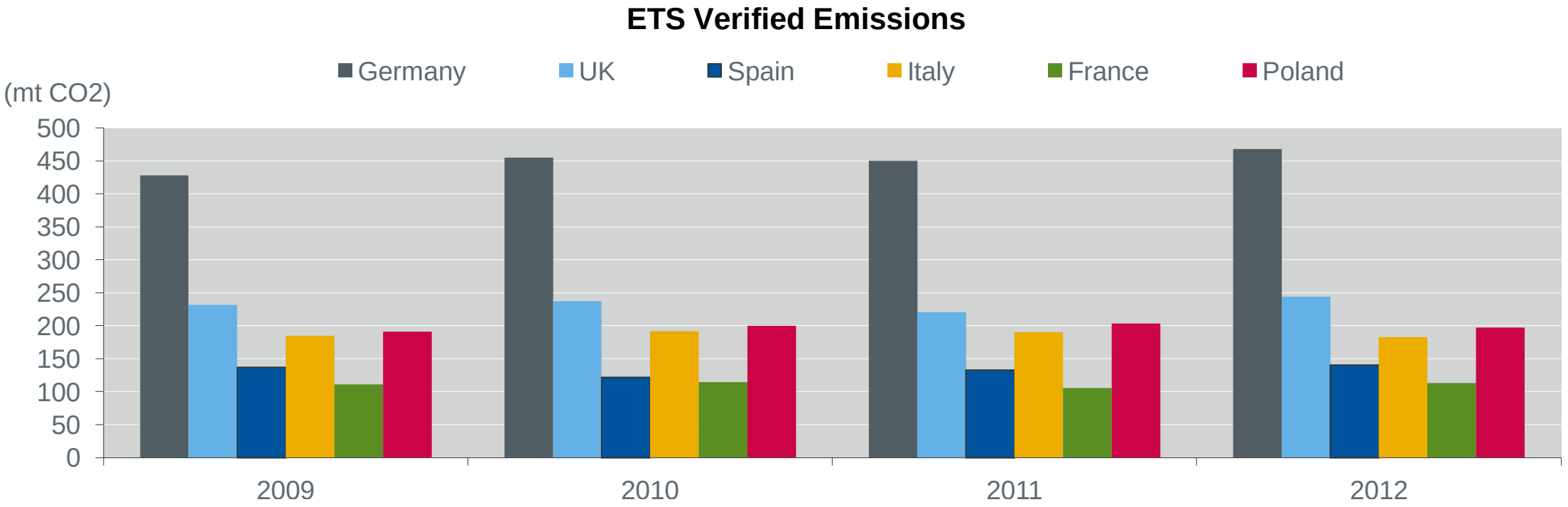


- **Portfolio composition: 100+ entity ratings (split between networks and integrated and generators)**
- **Over 50% of ratings in BBB range, around 25% in A range and 15% in BB range**
- **46% are either BBB+ or A-**
- **Existing ratings drifting down, new ratings on average lower than before**

Source: Fitch

There Must be Good News Here Somewhere…

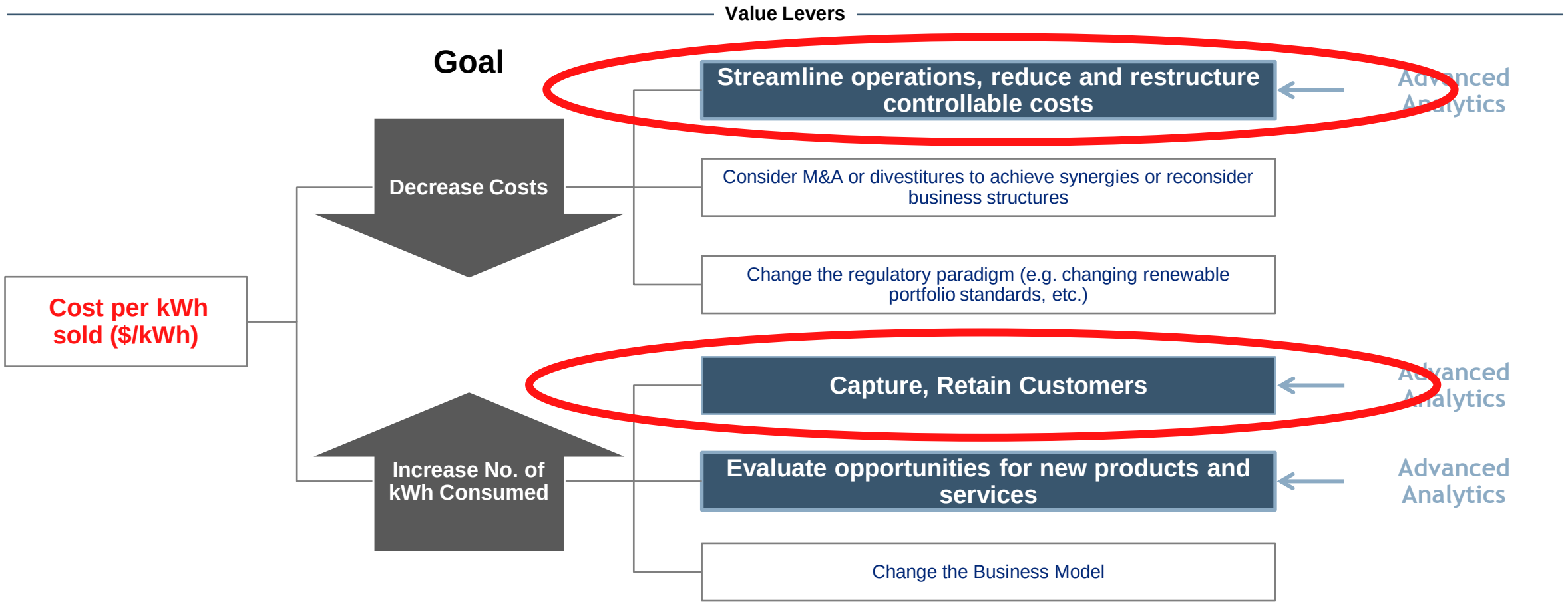
So, what's the impact on emissions?



- **Largely a function of increased industrial activity, carbon dioxide emissions increased compared to the crisis year of 2009**
- **But increased coal burning and nuclear decommissioning in Germany add to the trend**

Source: European Commission

What Options Exist?



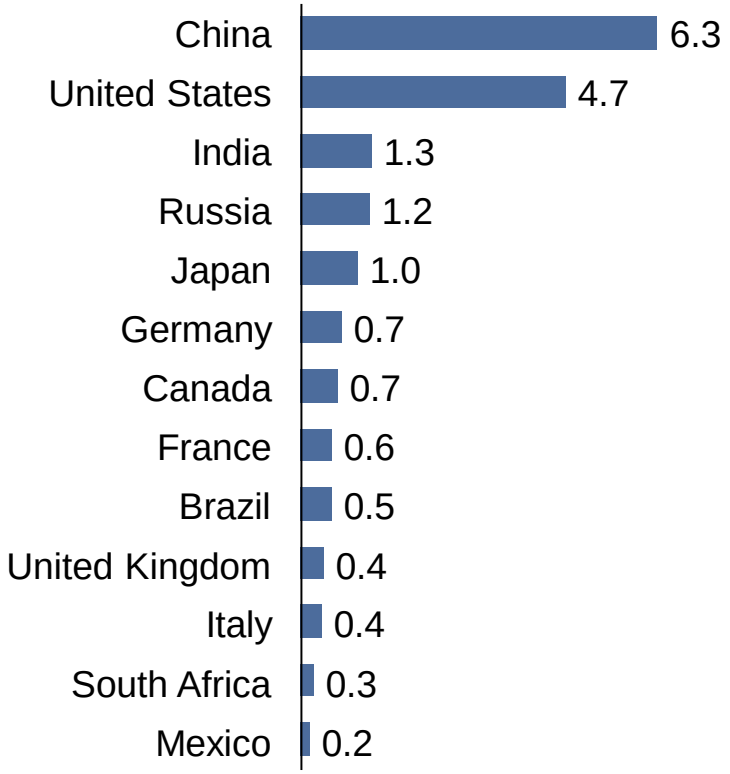
Source: 'The Math Does Not Lie: Factoring the Future of the US Electric Power Industry' – Deloitte Energy & Resources Dbriefs, Jan 2013

Agenda

- Industry Backdrop
- Euphemism City: “Revenue Protection”
- Q&A

Global Prevalence of Energy Theft

ANNUAL VALUE OF 1% THEFT
$B



Assumption: $0.12/kWh retail

Source: Awesense (graphic); Oracle Analysis (figures)

Local Impact of Energy Theft

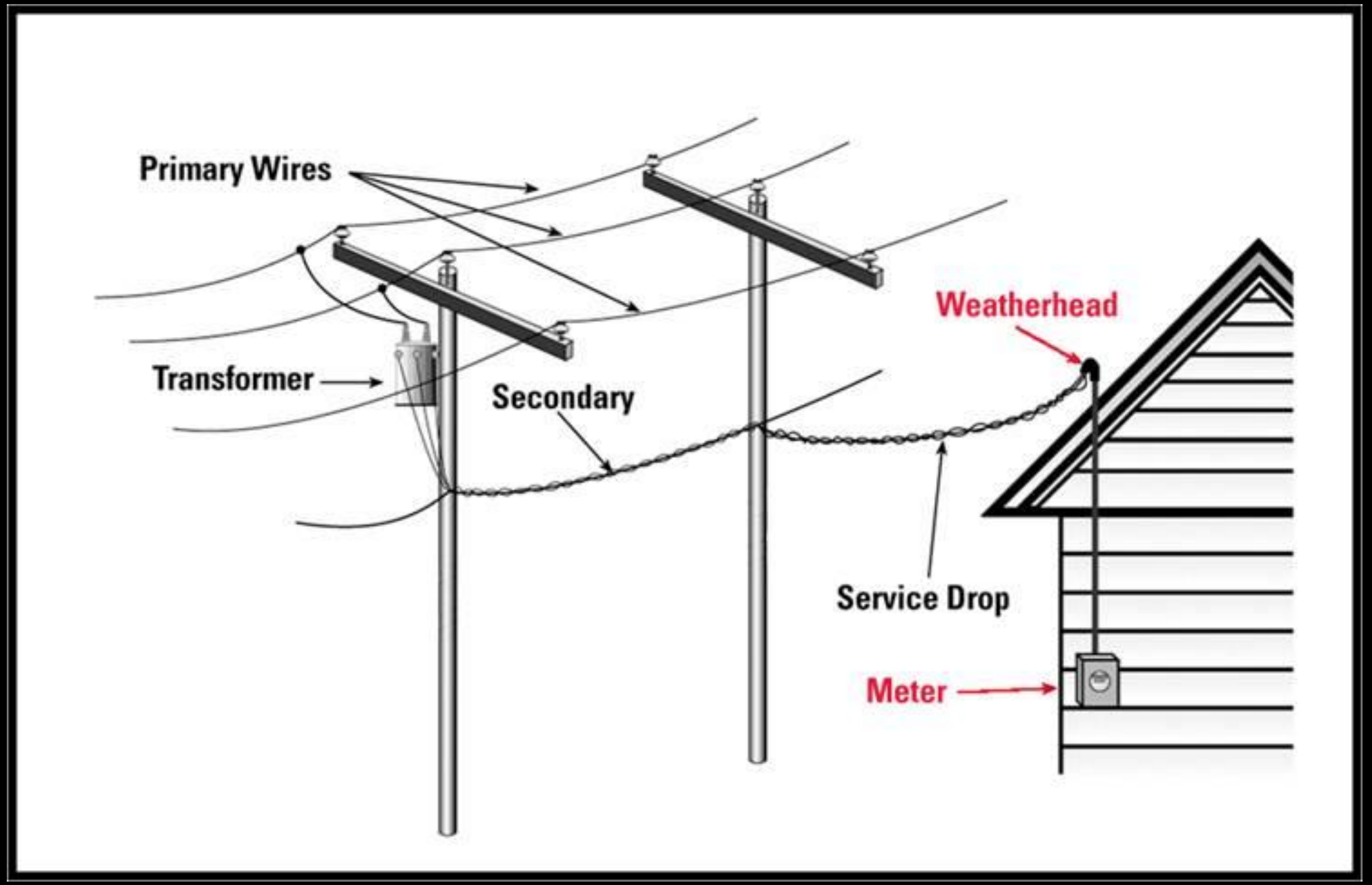
Pacific Gas and Electric Example

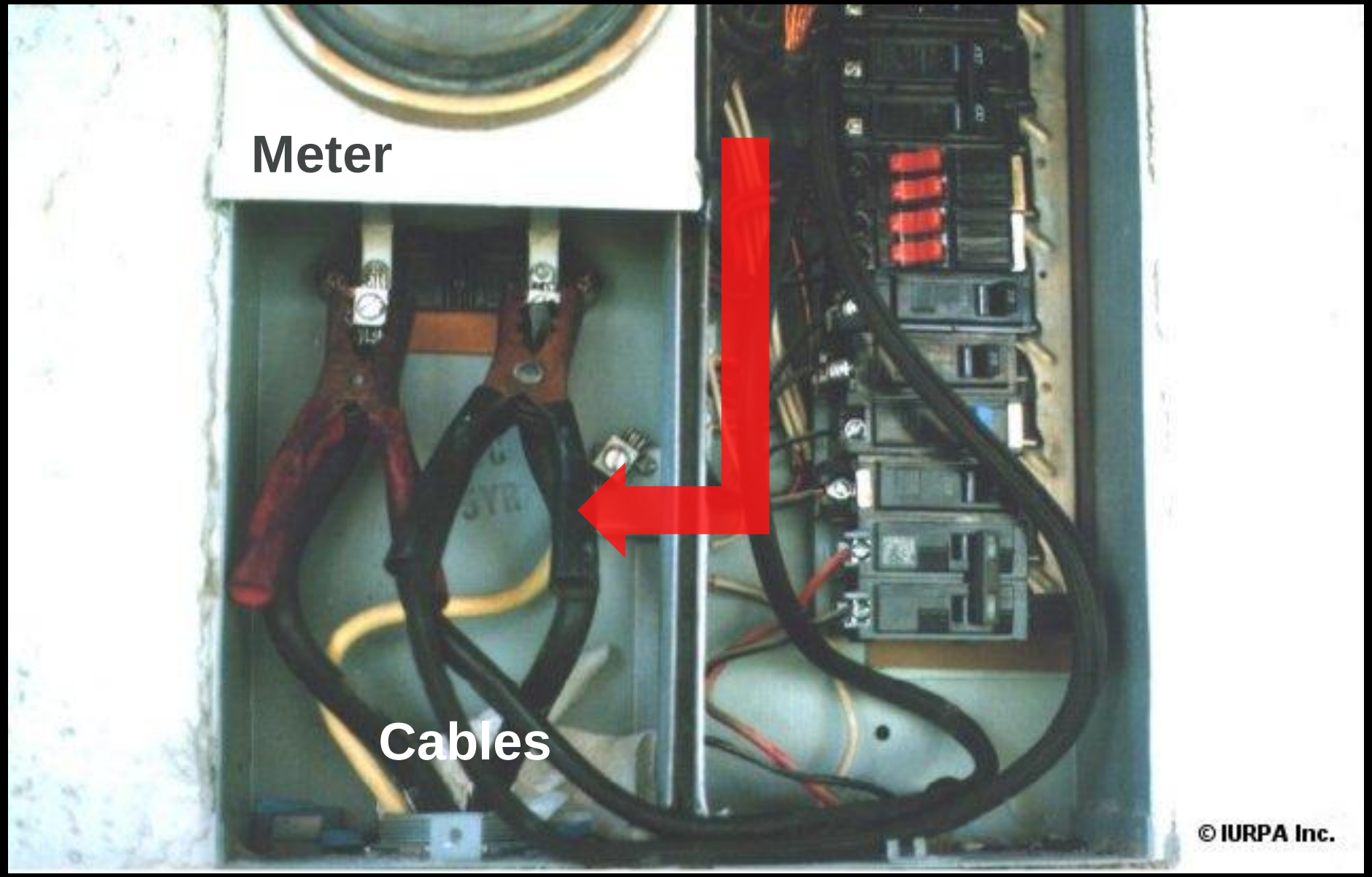
2013 MWh sales:	84,045,146
2013 Profit:	$828m
Value of 1% theft:	$101m

1% = 12% of profit

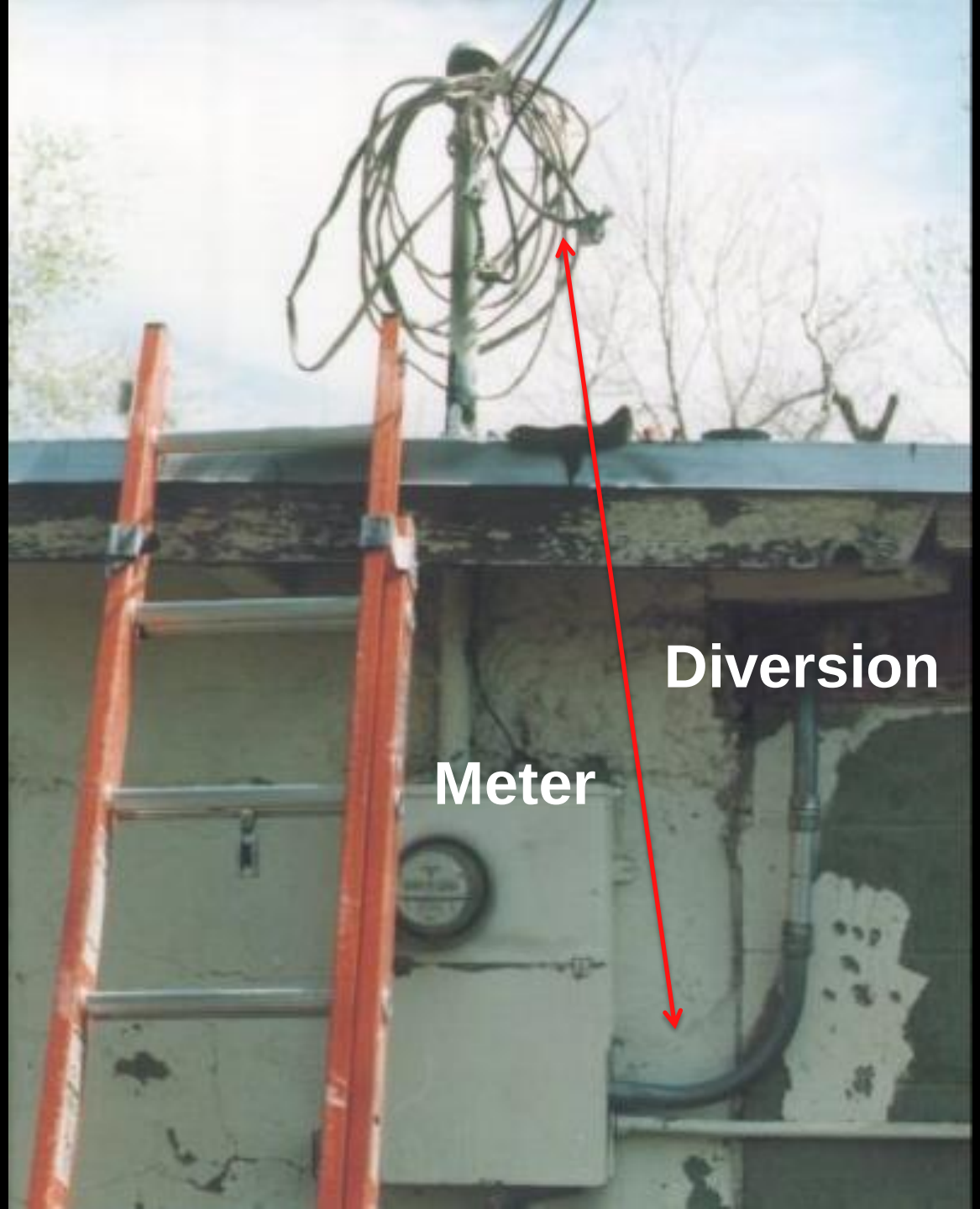
Assumption: $0.12/kWh retail

Source: Awesense (graphic); Oracle Analysis (figures)


Primary Wires
Transformer
Secondary
Weatherhead
Service Drop
Meter



Jumper cables diverting electricity around the meter

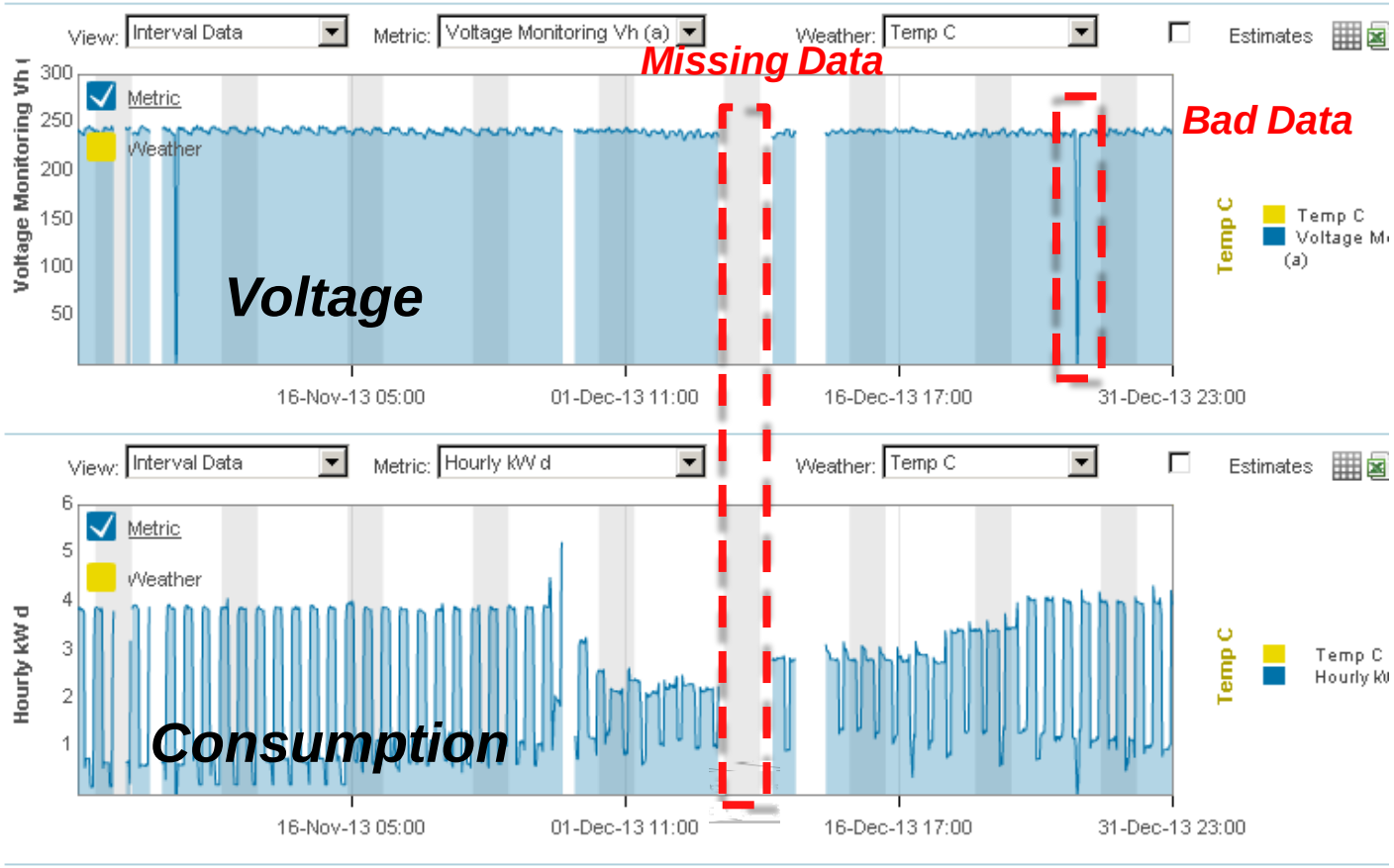


Tap at weatherhead diverting wires around meter

Courtesy York Regional P.D. (Ontario, CA) & BURPA Inc.

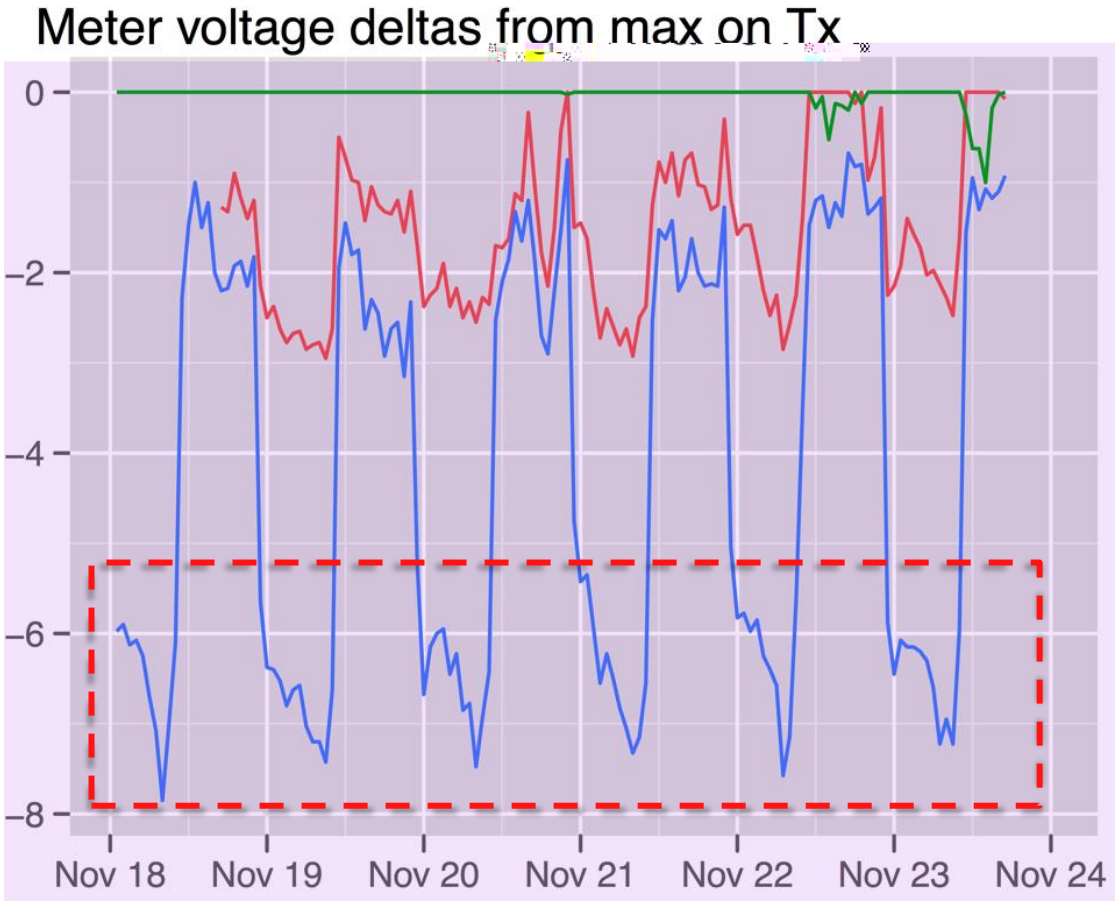
Data Curation

- Intelligent Data Systems require curation
- Google Maps –
  - Many people working actively to correct errors
  - Appears to work automatically but the algorithms only get better via manual input
- Platform to curate meter data
- Deal with Data Issues and Discover Relationships: Voltage

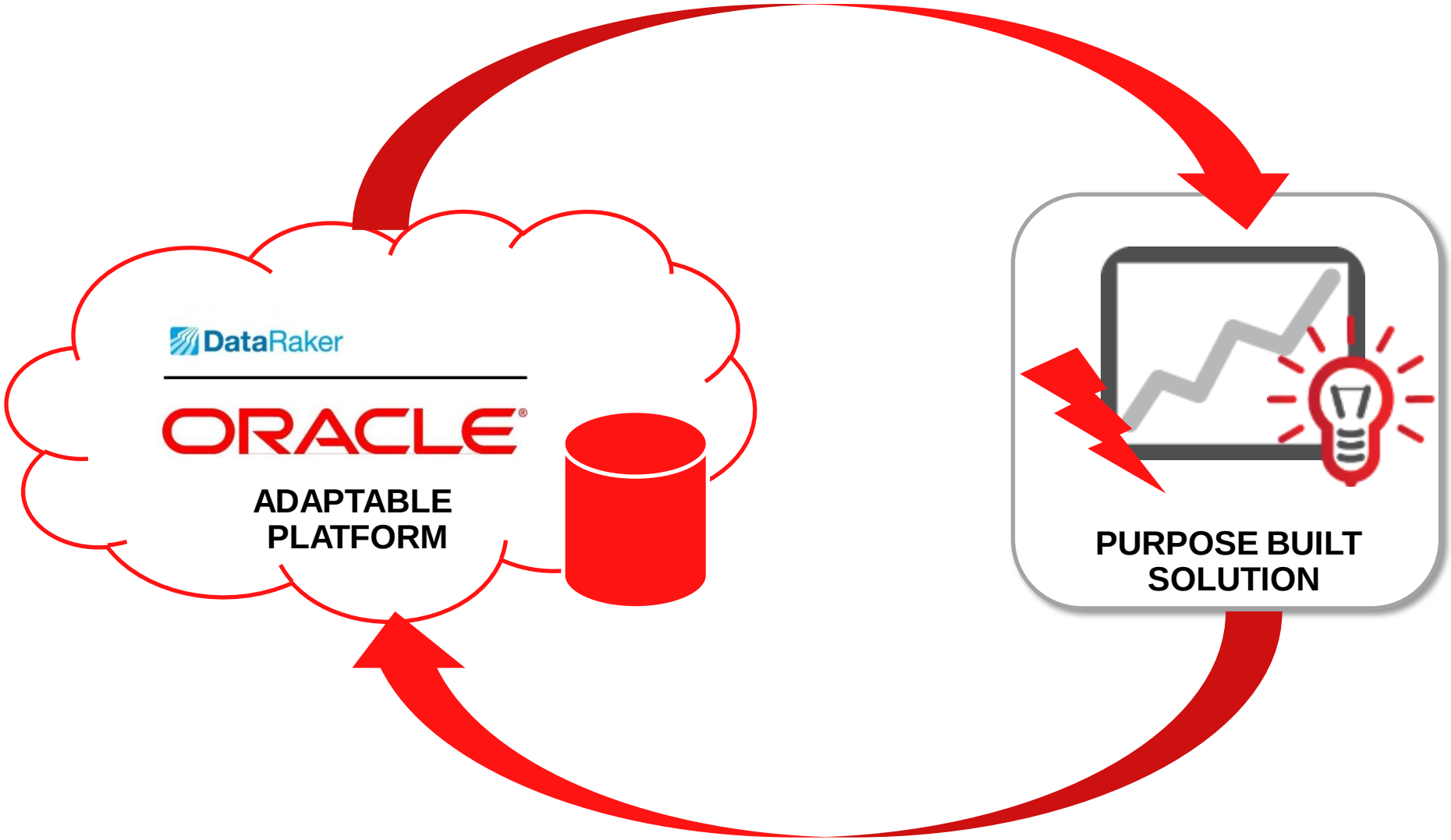


Model

- Technical Loss = 2*Resistivity*Length*Current
- Power (kWh) = Current * Voltage
- …Based on data received…
- Expected Voltage = 240 - 2*Resistivity*Length*(Power/Voltage)
- **Most likely <u>non-technical loss</u> when Actual Metered Voltage < Expected Voltage**



Solution Platform



Agenda

- Industry Backdrop
- Euphemism City: “Revenue Protection”
- Q&A

We’re Hiring

irecruitment.oracle.com