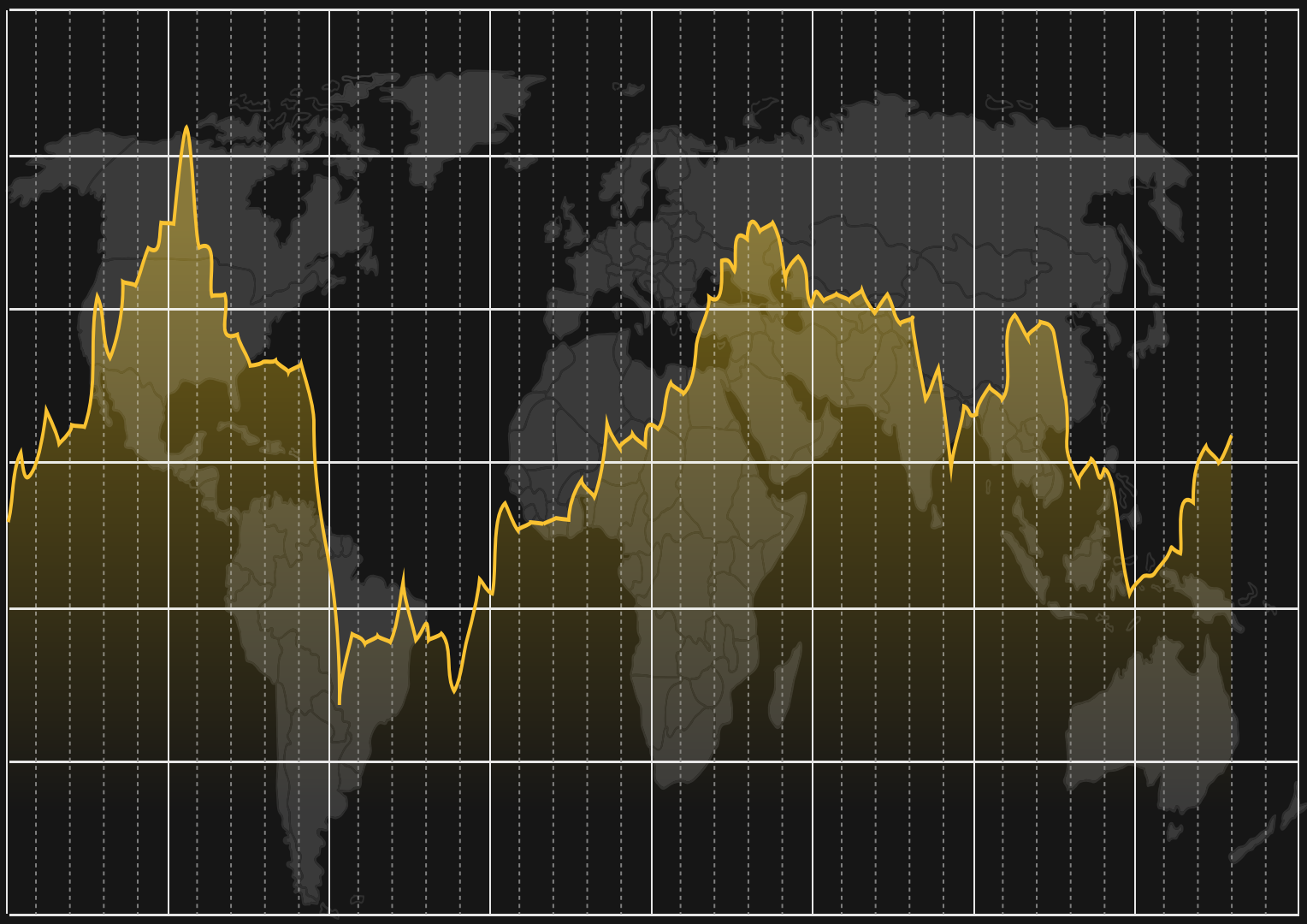
exponential energy
FORTUNES

Why the energy market is ripe for exponential disruption



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Why the energy market is ripe for exponential disruption

Over a century ago pioneers like Thomas Edison and Tesla helped create the modern energy system – and it's barely changed since.

The current industry is old, outdated and inefficient…

Which makes it RIPE for disruption – driven by new, smart and fearless technology firms launching an all-out assault on the industry.

James Allen
Publisher and Editor, *Exponential Energy Fortunes*

Fellow investor,

If I asked you all what the greatest technological transformational change you have lived through, I'm guessing most of you would answer, "the internet". And you wouldn't be wrong. The internet has fundamentally altered how society operates and how we communicate with each other.

But what about if I also included the changes that your parents, grandparents or great-grandparents have lived through?

The answer wouldn't be the internet, not by a long stretch.

In fact, in terms of transformational change, the World Wide Web would fall some way behind a technological innovation from a little over 125 years ago.

In the late 1800s and early 1900s, a few inventors on either side of the Atlantic figured out – in a period of less than 15 years – how to harness electricity as a serious source of power.

Imagine that: in just a few years, a reliable system of electricity generation, transmission and conversion was created that fuelled unprecedented levels of economic growth.

No other technical innovation has had such a far-reaching impact on modern civilisation as the dawn of the electricity age.

Although a British scientist by the name of Michael Faraday discovered the basic principles of electricity generation, American inventor Thomas Edison boasts the title of the "Father of Electrification".

In 1882, at the Holborn Viaduct in London, Edison demonstrated that electricity could be distributed from a centrally located generator through a series of wires and tubes (or

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conduits, to use the more technical term). Simultaneously, he focused on improving the generation of electricity, by developing a coal-fired facility called the Pearl Street Station in New York City, the world's first permanent centralised power plant.

As Robert Bryce wrote in his book Smaller Faster Lighter Denser Cheaper, Edison's Pearl Street Station made lighting cheaper and sparked a wave of electrification that fundamentally changed human society:

> *Edison's breakthrough designs at the Pearl Street plant allowed humans to reproduce the lightning of the sky and use it for melting, heating, lighting, precision machining, and a great many other uses. Electric lights meant workers could see better and therefore make more precise drawings and fittings.*
>
> *Electricity allowed steel producers to operate their furnaces with greater precision, which led to advances in metallurgy. Electric power allowed factories to operate drills and other precision equipment at speeds unimaginable on the old pulley-driven systems, which relied on waterwheels on steal power.*
>
> *As Henry Ford wrote in 1930, without electricity 'there could be nothing of what we call modern history.' Electricity, he said, 'emancipated industry from the leather belt and the line shaft.'*

Pearl Street's "central" power plant design was an important shift from small-scale, on-site generation to industrial-scale power, and soon became the model for the entire power generation industry.

In fact, by 1890, just eight years after Edison launched the Pearl Street station, there were a thousand central power stations in the United States alone.

And the same system remains in operation today.

Despite fundamental technological changes – including the way we generate electricity – the power system model remains virtually unchanged since Edison's Pearl Street Station.

If Alexander Graham Bell returned to the land of the living today, he wouldn't be able to comprehend the technological advances in telecommunications over the last 125 years.

But if Edison were to leap from his final resting place, not only would he recognise our electricity system of today, he would probably be able to fix it to boot.

Most electricity service is still delivered from large, centralised power plants out to individual homes and businesses over an interconnected grid; a hub-and-spoke model with power flowing in one direction.

Just like in Edison's day, utilities still form the backbone of the electrical grid. They sell electricity that is mostly derived from burning fossil fuels in centralised stations before being distributed over a network of power lines.

But this system is now evolving. The companies bringing about that change are all part

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of the explosive trend I've been researching, and will be bringing to you in the pages of *Exponential Energy Fortunes* every month.

Ripe for disruption

Before we go any further, it's worth stepping back and looking at how the energy market works today. In its simplest form, the standard supply chain still looks something like this:

1. THE ORIGINAL SOURCE: energy comes from fossil fuel sources such as coal and gas or, in more recent times, from renewable sources such as solar and wind.

2. GENERATING ELECTRICITY: this energy is then harnessed and produced in large power plants spread out across the country or region (coal-fired power plants or wind farms, etc).

3. MOVING ELECTRICITY: electricity is transmitted hundreds and thousands of miles through high tension lines and pylons.

4. DISTRIBUTING ELECTRICITY: from local substations, electricity is distributed accordingly through transformers and smaller, lower voltage power lines, to the consumer. This is where all the tangled power lines you see come into play.

There are an array of problems with this model. And they all come down to one thing: **centralisation**.

Right now, the system concentrates power in the hands of a relatively small group of organisations. A small number of energy firms, and an even smaller number of countries with large supplies of fossil fuels have outsized influence.

Obviously, these companies (and countries) have very little incentive to change the system. They possess all of the power (literal and metaphorical). Which is why the system is broken. It's why energy is expensive. And it's why energy firms are some of the most hated companies in the world.

You can boil the problems of centralisation down to four key strands:

1) Complex supply chains

One of the main problems with the model above is that energy is produced and supplied by multiple middle men who all get their hands on the stuff (and take their cut) before we consume it.

Whether it is a utility company, grid operator or national infrastructure stakeholders, electricity travels long distances and through many different corporate entities before it reaches the end user: households and businesses.

Today, there are energy producers, utility distributors, local billing companies, meter reading and manufacturing services all splitting up the value chain before the consumer

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uses the power it is billed for. Each stage in the chain results in a higher cost for the consumer.

2) Electricity wastage

The electrical power system is shockingly inefficient.

Electricity must be generated and transmitted from large power plants to the consumers via extensive networks. The transmission over long distances results in power being lost. Estimates vary as to the volume of electricity lost in this process, though some studies have concluded that up to two-thirds of the fuel burned to generate electricity is lost in the generation and delivery process.

Or, to put it another way, our electric power system operates at approximately 33% efficiency!

3) Security risk

When demand peaks or even surges, central power plants are sometimes unable to meet demand which results in rolling blackouts. This is often seen in developing countries, though stories of tight power supplies are also a staple of British newspapers, especially in winter.

What's more, a central plant is also vulnerable to hackers or terrorists that have reason to leave large regions without electricity for periods of time.

4) The grid isn't clean

The fossil fuels on which most standard power plants operate produce detrimental greenhouse emissions for the planet and its inhabitants. The system was also not designed to cater for unpredictable renewable sources such as wind and solar that are increasingly being fed into modern grids. In fact, the grid was designed to keep the supply of power steady and predictable. But energy from renewable sources isn't steady and can't be controlled – a windy day can overload the system, while sudden cloud cover above a solar field would make it hard to keep the lights on.

It should seem obvious by now that the entire centralised model is outdated. In fact, I expect the entire utilities sector will become the latest case study in business disruption over the next few years.

Death spiral

Those countries that fail to move away from the outdated model I've outlined above risk entering a "death spiral". The current business models, heavily weighted towards the centralised production of energy, will not satisfy future demands.

You see, not so long ago, providing electricity was a relatively simple affair.

Utilities guaranteed a constant supply of power by building plants that ran on coal, nuclear energy or even hydropower, running these units around the clock to supply so-

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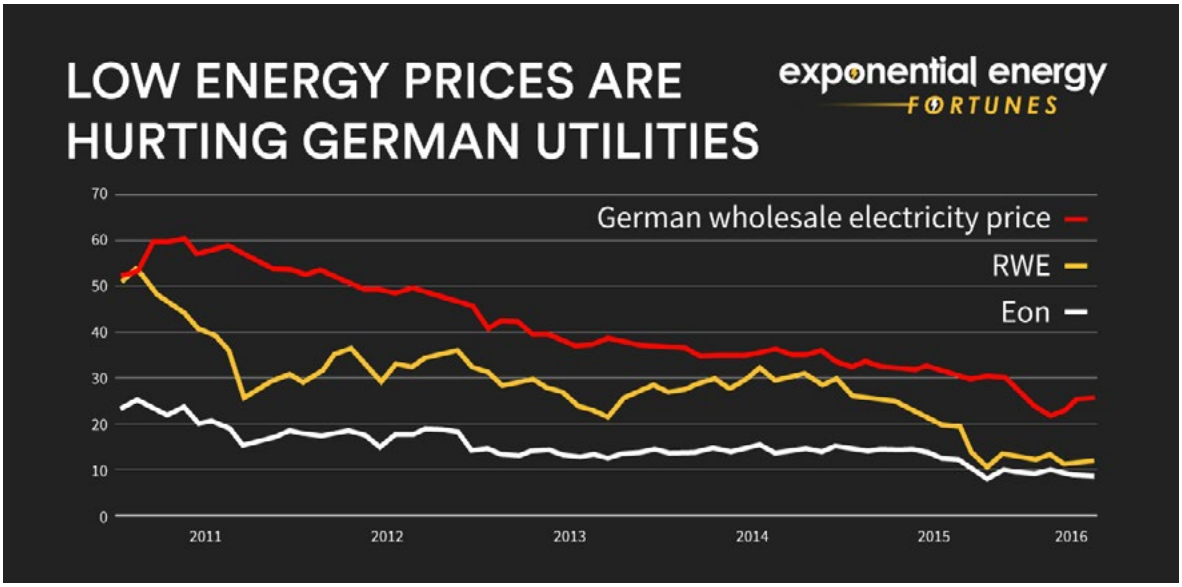
called “baseload power” – the amount of power that is always needed, no matter the time of day. Then, to meet the lunchtime or early evening spikes in demand (known as “peak power”), utilities topped up the power supply by turning on plants that could more easily be powered up or down, such as gas-fired units.

But the deregulation of electricity markets in the late 20th century removed this system and allowed power plants to produce according to the “merit order”. Now electricity markets meet demand by first taking electricity from the cheapest supplier, then the next cheapest, until they have all they need. The price paid to all concerned is set by the most expensive source in use at the time. Because wind and solar do not need to buy any fuel, their marginal costs are low. They thus push more expensive producers off the grid, lowering wholesale prices.

That worked fine when there weren’t many renewables on the grid. But the growth in green sources over the last few years has rendered the system obsolete. When the wind doesn’t blow or the sun doesn’t shine, the market needs the very same expensive sources of power that are now not economic to run!

The rapid rise of renewables onto the grid has crushed wholesale power prices, decimated utility margins, and left the incumbent firms with structures that are hopelessly out of date – and ripe for disruption…



Europe’s 12 biggest utilities, failing to foresee the shift to clean power, have written off more than €100 billion of assets since 2010. Many nuclear, coal and gas-fired plants have been closed, mothballed or – if still running – fallen in value.

The Stoxx Eurozone Utilities Index has fallen by as much as 60% over the last decade.

Five signs unstoppable change is coming

I should point out at this stage that I’ve seen just how old and inefficient the energy market is up close. I’ve spent the last decade working on various energy market desks in London and the United States.

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In fact, for five years I headed up the Montel energy bureau in New York. It was essentially a front-row seat on the industry. Some of the outdated practices you hear about on the ground are crazy. You would barely believe how backward a lot of it is.

I saw how the industry was ripe for disruption. I saw the companies emerging to challenge the energy superpowers. And I saw opportunity. Which led me to walk away from my position in New York, join the Southbank Investment Research team and share these opportunities with *Exponential Energy Fortunes'* readers.

Huge change is coming. It'll sweep away the old technology and reshape the energy industry entirely. There are a few other tell-tale signs – five by my count – that suggest that the entire industry is on the cusp of transformational change.

1) Consolidation of market power

In an article posted on Forbes in 2018, entrepreneur Todd Belveal, founder and CEO at Washlava, a start-up disrupting the self-service laundry industry, said that one of the important signs that an industry could be disrupted is imbalance:

> *"Oligopolies, where a few companies have consolidated vast amounts of the market share either on the supply or demand side, are often good candidates."*

The energy industry is a great example. Half a dozen vitally-integrated major energy companies have come to dominate the market in the UK, supplying about 95% of all household gas and electricity. The spike in gas prices throughout 2021 – which looks set to continue throughout 2022 – has killed off a number of emerging energy companies that sought to challenge this oligopoly.

The concentration of market power is often even more pronounced in mainland Europe. In fact, the two major utilities in Germany, RWE and E.ON, are both headquartered in the same small town of Essen.

The majority of the industry has been dominated by decades-old juggernauts, which are too slow and complex to adapt to new technologies. As anyone who has studied economics will know, oligopolies will more often than not be more interested in preserving the past rather than innovating for the future. But the large utilities are now undergoing major shakeups that could potentially see a shift in the status quo.

2) The use of outdated technology and systems

Belveal said industries where the major players are stuck using old technology and systems, which makes it difficult for them to implement new technology quickly, are usually ripe for disruption.

> *"Old technology is often used. Not because it's the best way to do things for consumers, but because it's the best way to do things for a few entrenched business interests."*

The energy markets are a case in point. It's an industry that is still very much operating in

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the analogue age.

To give you an example, you still hear of grid operators, particularly those in mainland Europe, *sending Excel sheets by fax* to their counterparts in other countries when undertaking their scheduling tasks (scheduling provides the necessary information for the transmission system operator (TSO) to operate and balance the system as well to carry out security analysis).

And it's not just that. Many deals are still concluded on the telephone, over the counter, away from electronic screens. Many markets are still effectively giant old boys' clubs.

3) Customer frustration

You don't need me to tell you just how frustrated we all are with energy companies. I'm sure that I'm not alone when I grumble about utility companies immediately responding to a rise in wholesale market prices by hiking retail prices. But when wholesale prices fall, consumers rarely benefit…

In fact, according to a Guardian/ICM survey, energy giants are now even more disliked than banks. In the survey, people were asked to pick which two or three villains from a "rogue's gallery" of businesses they most disliked, and 46% picked gas and electricity suppliers – more than any other sector.

People are increasingly fed up with the status quo and hungry for new services and providers.

4) Market complacency

A classic sign of an industry ripe for disruption is that the firms within it see themselves as indestructible. Previous success can become the basis of failure by creating complacency that slows down learning that makes the organisation more resistant to change. That means that by the time they realise they are being disrupted it is too late.

You could certainly argue that the energy industry has become complacent in recent years, and it appears that this mistake is going to cost them dearly in the coming years. Utility firms have consistently introduced price hikes without adding any real value to their service offerings.

What's more, you go to any industry event and it's pretty much guaranteed that a greying gentleman in an even greyer suit will be the headline speaker. And it's not just who they are that is indicative of an industry that can be out of touch, it's also what they say.

I remember going to conference around five years ago when an executive from one of Europe's largest energy companies was convinced that renewables wouldn't gain a strong foothold in the market!

But incumbent firms may be surprised at the pace of change awaiting them, just as they have been with the take-up in renewables over the last few years.

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If they don't realise it already, the days of big, centralised power units controlled by big, cumbersome utilities are coming to an end.

5) Tension points

According to Luke Williams, author of *Disrupt: Think The Unthinkable to Spark Transformation in Your Business*, the key to identifying markets that are ripe for disruption is to look for so-called *'tension points.'*

Tension points aren't typically big enough to be considered major problems, which means most businesses aren't paying attention to them.

You don't have to look hard to find tension points in the energy markets.

For example, did you know that when it's particularly windy in Britain, wholesale power prices often fall so much that generating companies have to pay the grid to take their electricity?

It's true. Utilities are losing money making electricity. In both the UK and mainland Europe, wholesale electricity prices turn negative when there's too much wind or solar power on the system. While such negative prices may be needed in practice to balance the system, they also indicate underlying market tension.

They simply reflect sharp conflicts among major players in the industry over the best way to weave new electricity sources into a system that remains dominated by fossil-fuel-generated power.

Negative prices are indicative of an industry model that's out of date; one that was built when renewable sources of power did not exist.

The utility business model is not just broken, it's doomed to obsolescence.

Utilities certainly can't say they haven't been warned.

Back in 2013, PricewaterhouseCoopers released a report that spelled out the threat in no uncertain terms.

> *"Today's power utilities market is facing major disruption"*
>
> – PwC

The traditional utility model is doomed, it goes on to say, "if these companies fail to solve for how to produce more energy, at cheaper prices, amid uncertain regulatory schemas (sometimes none at all), their revenues are cannibalised by a mortal threat to the industry: decentralized generation."

In fact, judging by the fact that 94% of respondents to the PWC report expected the utility industry's status quo to be completely shaken up in less than 20 years, the executives at utilities must realise change is coming.

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They have greatly succeeded from a lack of competition (not unlike phone companies before cell phones) and certainly haven't had to trouble themselves with too much innovation along the way.

But not for much longer.

Change is coming.

The traditional, centralised electrical system is shifting towards a more distributed, responsive grid driven by technological innovation and evolving customer demands.

> *"A virtual mob of new technologies is storming the rigid architecture of the Edison-era electric grid, promising radical improvements in its efficiency and usefulness.*
>
> *For consumers struggling with the steadily rising cost of power, the revolution promises greater control, allowing them to determine when, where and what kind of power to use. It will also turn utilities from one-way pipelines into complex webs where energy is produced and traded in multiple directions with the speed and efficiency of a stock exchange.*
>
> *And for society at large, it holds the tantalizing promise of an affordable system fully run on renewable energy."*
>
> – The Star, 28 September 2017

For investors… it's even more exciting.

This next-generation energy system will transform utility business models and open up a dizzying array of new opportunities.

Energy is moving from the analogue to digital age.