By Glen Hiemstra
Founder & CEO, futurist.com

ENERGY 2025 IS surprisingly different FROM ENERGY 2017

Three main forces

The energy business will experience a great deal of change between now and 2025, some of which will be truly disruptive to older ways of doing business. Three primary disruptive forces will reinforce each other and lead to a surprisingly different global energy picture over the next decade. These three forces are systems intelligence, environmental and economic imperatives, and sunshine-based electrification. As they play out, energy consumers will have more choice, energy producers will require greater efficiency to survive, and the IT companies that make energy-related products on the producer and consumer sides will have more opportunity than ever.

Sunshine-based electrification, which includes both solar and wind energy, is a dominant and accelerating trend. Solar energy generation hit 1 percent of all global electricity generation in 2015, after several years of record development and investment, especially in Europe, the United States, Japan, and China. For example, China is currently the fastest growing market, installing 10.6 GW in 2014, followed by Japan with 9.7 GW and the US with just over 6.5 GW. In 2014 in Europe, solar energy produced more electricity than nuclear energy for the first time, according to Solar Power

According to China News Agency, Qinghai in China ran for seven straight days completely on renewable energy generated from solar, wind, and hydro power from June 17 to 23, 2017. The 1.1 billion kilowatt hours generated by these sources was the equivalent of not using 535,000 tons of coal. Conversely, India and China produced more coal for power plants in the first months of 2017, reversing a steep trend of declining production. On a global scale, then, are we leaning towards renewable energy sources or traditional fossil fuel sources?

Europe in its Global Market Outlook 2015-2019. The same thing happened in the US in the first quarter of 2017.

Investment in solar and other clean energy lagged in 2016, falling 18 percent to US$287.5 billion from 2015's record high. This was driven by a decline in demand in China and Japan. However, despite the lower dollar amount of investment, solar technology is becoming cheaper. Thus, the amount of solar and wind energy attached to the global electricity grid grew by another 19 percent in 2016. It's this latter growth rate that's key.

An average growth rate of 20 percent suggests a doubling time of just 3.5 years. This means that solar will be a rapidly growing force in global energy by 2025. While a small percentage of the total energy picture, it's the one with the brightest long-term outlook. To better understand why, try doing this: If the sun is shining where you are, step outside for a moment, look up and soak in the sun as you count to 10. In those 10 seconds you've just witnessed enough energy hitting the Earth to power the whole world for a day – all of our industry, all of our homes, all of our transportation. Watch the sun for an hour, and you've witnessed more than enough energy to power the world for a year. Each hour, 430 quintillion – that's 430 with 18 zeros – Joules of energy reach the Earth from the sun. In context, humanity uses about 410 quintillion Joules in one year.

Cheaper and cleaner

If sunshine-based electrification is the dominant global energy trend, it's enabled and reinforced by the second dual force: environmental and economic imperatives. The first imperative, though still debated in a few countries, is the physical dynamics of global warming due largely to carbon and other emissions. The real question is whether we can deliver the incredible amount of energy needed for growing the world in a sustainable way. And it's here that economics comes into play.

In the past few years, providing

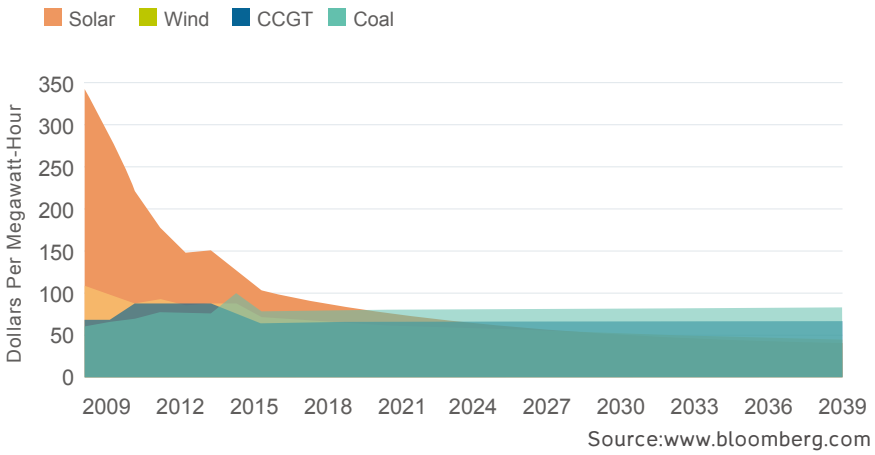
more energy via clean technology has become not just desirable for the environment, but also economically smart. Clean energy is becoming cheaper than traditional fossil fuel energy.

This isn't to say that the traditional oil and gas industry will vanish in the near future, as both will be used for many vital energy and chemical processing needs for many, many decades to come. Both also require advanced networking technologies, like Huawei's Intelligent Oilfield and Intelligent Pipeline solutions.

But, speak to anyone in that industry and you learn how much their world has been rocked in the past two years by supply gluts, dramatic price drops, and future uncertainty. These pressures on one of the world's largest industrial enterprises are only going to increase as we move toward 2025.

In January of 2017, Bloomberg New Energy Finance first reported that solar energy would soon be cheaper than coal at producing electricity, something many had assumed would never happen.

Cheaper solar energy



In fact, the price of solar energy has fallen so precipitously since 2010 that when the cost is placed on a chart comparing solar to other energy solutions, the falling price looks like something falling off of a cliff, and the future trajectory seems clear.

Because of economies of scale from greater deployment and improving technology, unsubsidized solar photovoltaics can now compete with natural gas power plants and will soon compete with coal plants. The electricity industry is recognizing that solar is a better bet for the long term, and in recent weeks we've seen the announced cancelation of new coal power plants in the US, India, and China. The economics of solar energy are so good that it's now generally more expensive to build natural gas-powered electricity plants than to install new utility scale solar.

As these economies of scale and advances in solar technology continue, they'll simply get cheaper and cheaper. This means that the remaining stumbling block to a major solar and wind revolution on the electric side will be the intermittency of these power sources – the sun doesn't always shine and the wind doesn't always blow.

However, these problems are being eliminated by improving technology and rapidly falling prices for utility scale batteries and electric vehicle

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batteries. The addition of large battery farms to solar fields has enabled both an island in Hawaii – and soon part of Australia – to become self-sufficient with solar arrays and batteries combined.

Innovation in action

Whole new product ideas can grow in this new, volatile energy future. The German start-up Ubitricity noticed that as street lamps are converted to LED lights, the energy demand on the system of street lighting is much lower, but the power is still there in the light poles. At the same time electric car drivers want regular charging stations, but don't have them. So the company invented a hardware and software solution that installs a plug into the light pole that connects to the electric cars of owners who subscribe. Software manages payments when the owner plugs into a retrofitted street lamp. The city and utility get paid, the car owner has many convenient places to plug in, and everyone wins.

Systems intelligence

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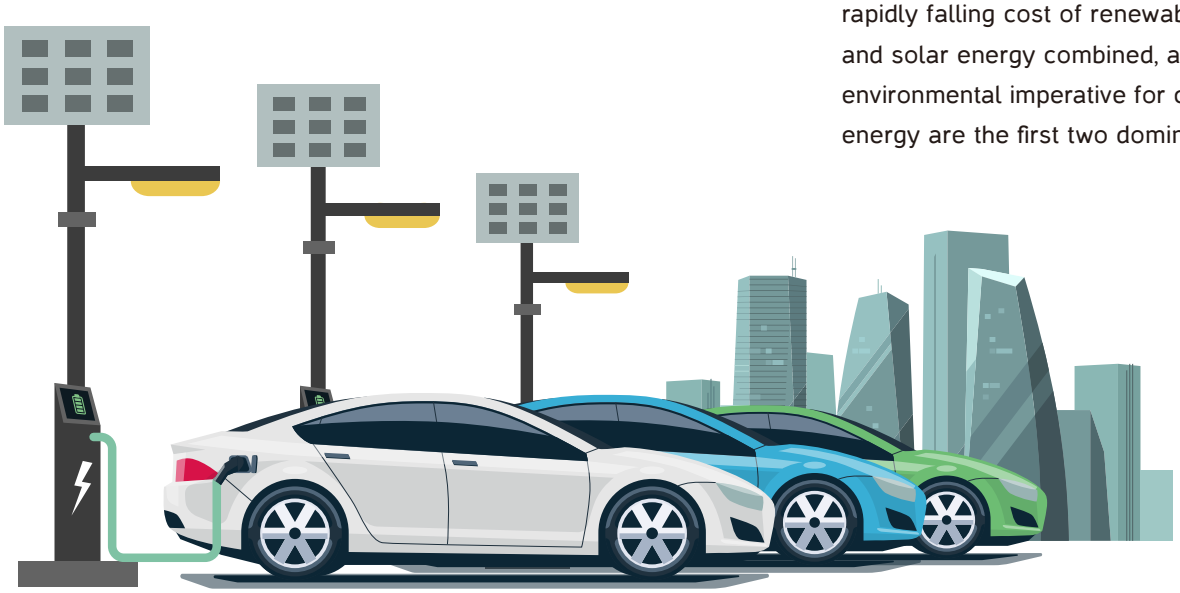


forces shaping the energy world in 2025. The third force, systems intelligence, will tie things together, lead to greater energy efficiency for both renewable and traditional energy providers, and, we predict, make the global energy picture quite robust, if volatile, in 2025.

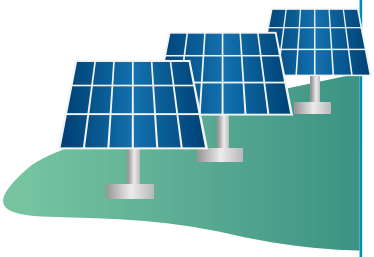
First, the dominant trend will be the electrification of energy. By this we mean that more transportation, including cars and trucks, will be electric. While we won't be there by 2025, a recent earth-shaking report by RethinkX suggests that by 2030, the transition to electric transportation will be dominant, which will drive oil prices down to US$25 dollars per barrel. Electric vehicles will cost the same as conventional cars by 2018, and over time become much cheaper than gasoline or diesel vehicles due to their simplicity and lower O&M costs.

But running more electricity demands a much smarter grid and much more intelligent switching and communication systems than old energy systems. With solar and wind growing there's great demand for robust prediction tools so that we know with precision where energy will be available or unavailable, along with the ability to move energy quickly.

10 SECONDS

of sun provides enough energy to power the Earth for

1 DAY



Electric vehicles will cost the same as gas cars by

2018

US$287 BILLION

was invested in clean energy in

2016

– a fall of

18%

from 2015

This is true even in local and micro-grids. Residential-scale power generation, such as solar cells on the roof, will work best if all homes know how much energy all the other homes or buildings are producing and using. Homes can use systems intelligence to best share all the energy produced and supplement power from an instant-on, utility scale natural gas power plant in the region. This will require a great deal of network intelligence and IoT tech.

Traditional energy companies – oil and gas primarily – will need to optimize efficiency to survive a world of lowering demand, supply gluts, and the prospect of US$25 oil. Exploration and drilling will need to be more efficient and intelligently planned. Refineries will need to improve their ability to quickly shift products.

Global energy in 2025 will look quite different from 2017. It will not be completely different, not yet, but the energy transition of the 21st century will be well underway.