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Has The Time Arrived To Transition Away From Fossil Fuels?

Not today, nor tomorrow, but sooner than many predict

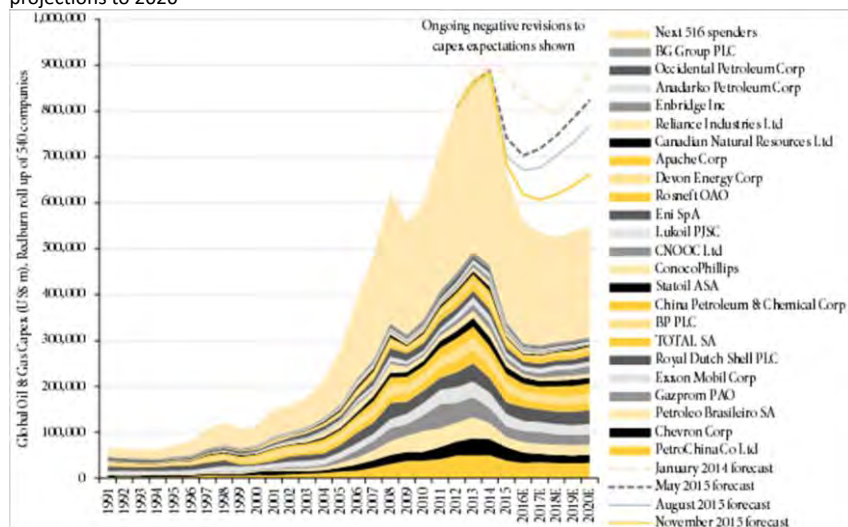
Prior to the **Industrial Revolution**, humans managed to survive without fossil fuels. The question is, having indulged in a carbon-rich period for the past two centuries, can they make an orderly transition to a sustainable fossil-free future without sacrificing the high standards of life that they have come to enjoy and expect? The 175 countries that signed the Paris agreement are wondering.

The mere fact that such a question is semi-seriously being contemplated in some circles is remarkable indeed. The fact that some experts believe that such a transition can be achieved in time to avert climate change is even more remarkable.

Among those who are brave – or foolish – enough to talk about an eventual transition away from fossil fuels is **Jeroen van der Veer**, ex-CEO of **Shell**, and currently Chairman of **ING**. In an interview with **Karel Beckman** of **Energy Post** published 5 April 2016, van der Veer said the unspeakable, crossing the line many current oil major CEOs do not dare cross yet.

Collapse of global oil & gas Capex may not fully rebound

Historic and projected Capex of 540 globally traded oil & gas majors, 1991-to present plus projections to 2020



Source: James Moore, Redburn Capital Goods Research, London, UK

Even more surprising was the tone of his message. Instead of repeating the old and tired message that it simply cannot be done and shouldn't even be attempted because it is impossible, van der Veer characterized the challenge as a great *opportunity* for oil and gas majors – remarkable indeed. Perhaps being the ex-CEO of an oil major gives one better insights and a license to speak the unspeakable. He said, among other things,

—The energy transition presents great opportunities for oil and gas companies to develop new forms of energy and gradually move away from fossil fuels.”

The former CEO of Shell, however, was quick to dismiss the notion that the oil majors are in danger of ending up with large **stranded assets**, as some investors fear and some environmental activists claim. He also made a distinction between oil majors and major oil exporting countries whose economies rely predominantly or exclusively on fossil fuels.

—A country like **Saudi Arabia** may be concerned whether they can exploit all their resources, but the assets on the balance sheets of the international oil companies are resources they will develop over the next 20 years or so.”

A few excerpts from the exclusive **Energy Post** interview appear in the accompanying box, the full text may be found at the website at the end of article.

What did Shell's ex-CEO dare say?

What is holding back investment, according to **Van der Veer**, is volatility in the market, in particular the instability of CO2 prices. “Companies are willing to invest, but if you have no idea what the CO2 price will be over the next 20 years, while this is essential for the profitability of the project, you will not commit your capital to it. Energy investments are highly capital-intensive, so it is essential to have some certainty about this from the outset.”

Van der Veer says 3 things are critical to the future of energy:

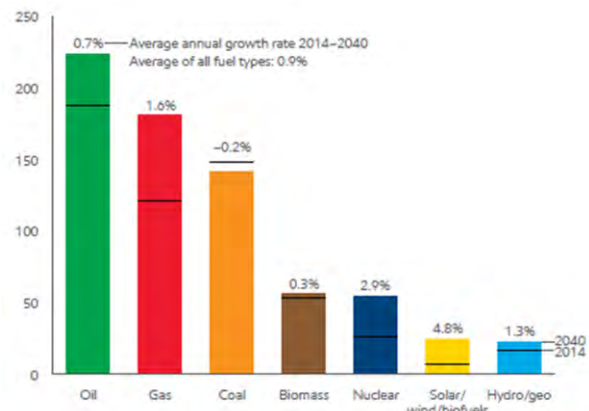
- First, the world is still not doing enough to **save energy**;
- Second, for large parts of the world, **natural gas** is the best transition fuel; and
- Thirdly, as the world is using more and more **electricity**, we need to develop **renewable** energies that are much cheaper than they are today.”

As a member of the **World Economic Forum** working group, he is developing scenarios “that stay within 2 degrees, but that the energy industry can believe in.” The exercise, soon to be published, show a decline of oil in the global energy mix from the current 31% to well under 20% by 2050, with share of gas slightly over 20%.

What will be the future of incumbent oil companies in such a future? “There are two schools on this topic”, adding, “I belong to the first school.”

How much longer will oil remain supreme?

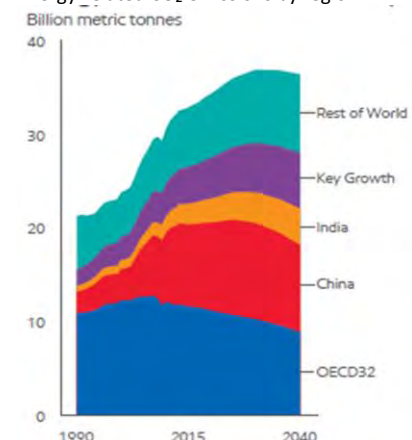
Global fuel demand 2014-2040 in Quads
Global fuel demand in 2040 – projections



Source: The Outlook for Energy: A View to 2040, ExxonMobil, 2016

Will that be good enough, soon enough?

Energy-related CO₂ emissions by region



Source: The Outlook for Energy: A View to 2040, ExxonMobil, 2016

- The first is that big energy companies develop new forms of energy rather than fossil fuels; and
- The second school says the mission of oil and gas companies is to produce oil and gas, and if this mission ends, then the companies end too. Then you pay out the dividend to the shareholders and stop.”

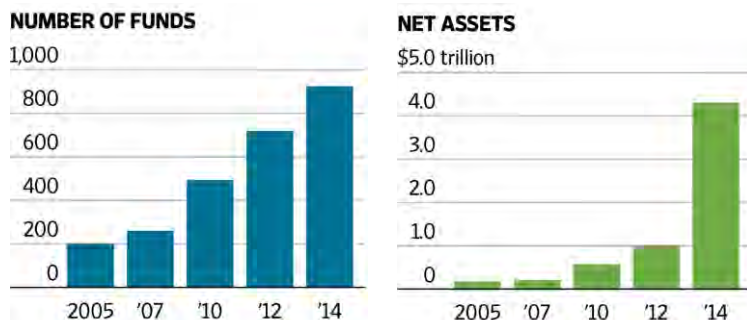
As for the **climate conference in Paris**, he says it may well be a turning point in energy history. “It is the first time that everybody agrees about the problem and has committed to tackle it.” There is no discussion anymore on the direction we need to move in. The big discussion now, he notes, is on the speed of the change. “Most politicians”, he adds, “are too optimistic about that. Most businessmen are too pessimistic.” ■

But why would anybody be talking about a transition away from fossil fuels? Why leave a party that has been so much fun? The answer may be the same given to a heavy smoker, drinker or, worse, a drug addict. Because it is not good for you. It was great fun while it lasted but it is not ultimately sustainable.

There are investment and pension funds, university endowments and others who are beginning to wean themselves from heavy exposure to fossil-heavy businesses not only because of environmental concerns but because they believe it is prudent investment strategy to avoid possible future risks (visual below).

Growth Factor

U.S. investment funds that incorporate environmental/social/governance issues into their investment decisions



Note: includes mutual funds, variable-annuity funds, closed-end funds, exchange-traded funds, alternative investment funds and other pooled products, but excludes separate account vehicles and community investing institutions.

Source: The Wall Street Journal

Speaking before a gathering of major global insurance companies in London in Sept 2015, the head of **Bank of England, Mark Carney** stunned his audience by pointing out the obvious, that billions of dollars invested in **fossil fuel assets** could conceivably become **stranded** as governments try to curb global warming.

Financial Times (1 Oct 2015) wondered if Mr. Carney was —far-sighted visionary or a dangerously deluded fool.” Not surprisingly, Carney became an instant celebrity among proponents of climate change, and a villain among climate skeptics. What he uttered

was not particularly new or novel – environmentalists have been saying it for some time. What made his comments controversial and important was that the words came from the head of Bank of England, an institution which oversees 1,700 banks, investment companies, pension funds etc. together holding vast sums of private and public money. Among his responsibilities is to prevent another collapse of the global financial systems as occurred in 2008.

That was *before* the historic **Paris agreement** in December 2015. The risks are more real and more imminent for those who wish to acknowledge them. Others, of course, can ignore the signals and warnings at their own peril.

Denmark, for example, has vowed to transition towards a fossil-free economy by 2050 including its transport sector. With abundant wind resources that frequently exceed the country’s total electricity demand, Denmark may indeed be able to pull it off without a hitch.

Neighboring **Norway** is looking into adopting a National Transport Plan with 100% electric cars, buses,

and small trucks by 2025. The scheme could conceivably become law, perhaps with modifications. Norway is blessed with huge hydro resources, which can also be used as storage, absorbing excess renewable generation, balancing the delicate task of matching variable generation and demand. Converting its transport sector to renewable electricity not only makes sense but can be done economically.

Denmark and Norway are, of course, exceptions. The transition to a fossil-free future will be much more difficult and take much longer for major economies where fossil fuels are seen as a way of life. Moreover, rapidly growing economies of **India, China** and others are less likely to be able to make the transition successfully anytime soon.

And for countries like **Saudi Arabia, Australia, South Africa, Indonesia** – to name a few – fossil fuels are the sole or main drivers of the economy. No serious politician will have the guts to even utter any words such as those uttered by the head of Bank of England or Shell's former CEO.

Yet as other articles in this newsletter describe, the broad outlines of an eventual transition away from fossil fuels and much higher utilization efficiencies of whatever energy forms are used, is beginning to emerge.

Coal, the most carbon heavy of fossil fuels, is already facing strong headwinds, and these pressures will only grow over time. **Natural gas** is roughly twice better than coal in terms of units of carbon emitted per kWh produced. It is half as evil as coal, but it is evil nevertheless. Much of the gas escapes from the wells and the pipes making gas not as attractive as it appears. **Oil** and its many derivatives, of course, are indispensable in many applications today – for example as aviation fuel. Its energy density will be hard to match for decades to come. It too, however, will face headwinds in due course as price of alternatives declines and their performance improves.

The chart on bottom of front page based on historical and announced investments of world's top 540 oil and gas companies, courtesy of **James Moore** of **Redburn Capital Goods Research**, illustrates a significant scaling back in Capex to 2020 reflecting the current depressed oil prices. But even when/if oil prices rebound to their historical levels – whatever that may be – how likely will the rebound in upstream exploration and development investments be?

Shell's former CEO suggests that many oil majors will be reluctant to invest heavily in expensive and challenging fields moving forward. Some may decide to put their eggs in different baskets. Few may decide to move away from exclusive reliance on fossil fuels. Perhaps some will come around to see renewables as a *complement* to their traditional business models rather than a competition.

He is not alone in seeing the beginning of the end of fossil fuels. In April The French oil giant **Total** announced that it wants to be among the top 3 global solar companies and will expand in electricity trading and energy storage. Total said it was creating a fourth business unit to cover gas, renewable

Less fossil fuels will be needed when buildings generate own energy

Transparent PV windows made by Solaria undergoing testing at FLEXLAB at Lawrence Berkeley National Laboratory can turn not just the roofs but windows into sources of energy



Source: Lawrence Berkeley National Laboratory's FLEXLAB

energy and power stating that the move will “strengthen its position as a global energy leader”, according to Total CEO, **Patrick Pouyanné**. The transition away from fossil fuels is *already* underway.

Even more surprising is an ambitious plan spearheaded by Saudi Arabia’s crown prince **Mohammed bin Salman** to create a **\$2 trillion sovereign wealth fund**, the largest in the world, to gradually wean Saudi Arabia’s economy *away* from oil. If Saudis see dependence on oil as a dead-end, it must be a dead end.

The writing, in other words, is on the wall. Not today, nor tomorrow, but sooner than many predict. ■

[Energypost](#)

US Electricity Market: Renewables And DERs Make It Hard On Generators

No demand growth plus flood of renewables and DERs puts thermal generators in a bind

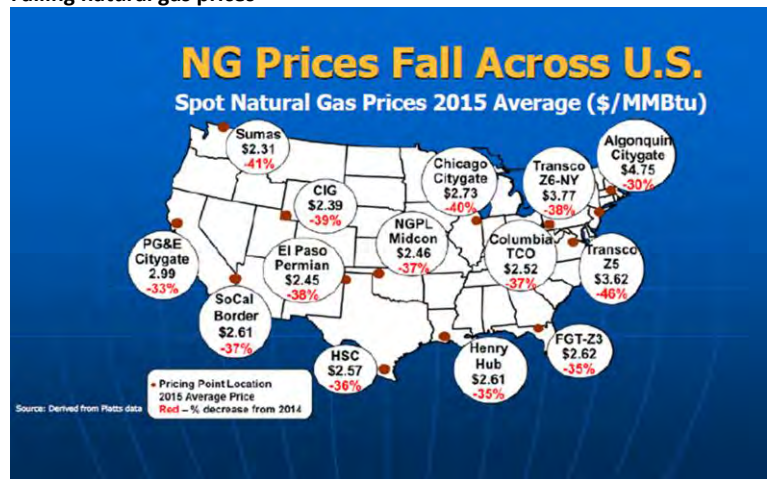
In mid-March 2016, the **Federal Energy Regulatory Commission (FERC)** released its latest state of the market report covering the period ending in December 2015. The flood of low cost natural gas (right graph) combined with flat demand for electricity (graph on page 6) meant low wholesale prices across the US (below right), squeezing thermal generators, especially coal-fired generators who continue to lose market share to lower cost gas.

Thermal generators are feeling the pinch of lower wholesale prices due to low natural gas prices plus the rising percentage of zero marginal cost renewables, increasingly flooding markets across the country.

As illustrated on the left of graph on page 6, solar generation accounts for 13% of installed capacity in California and 21% of peak load in California. Needless to say, it has cut into mid-day wholesale prices on **California Independent System Operator (CAISO)** prices.

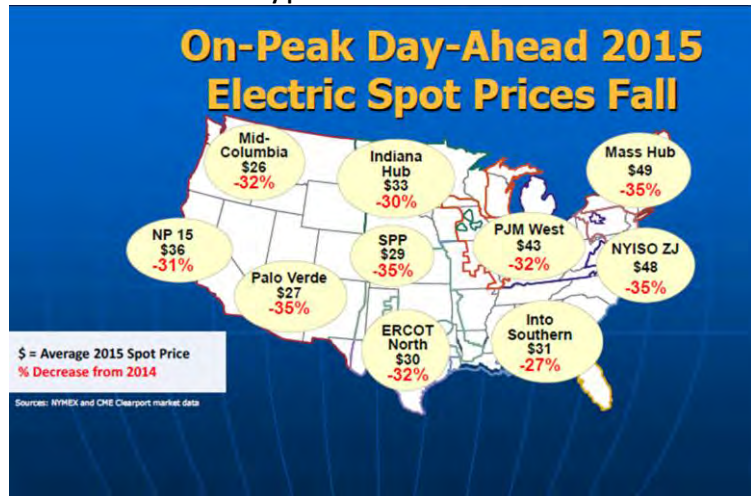
The same graph on right shows the impact of wind in **Midwest Independent System Operator (MISO)**. With little or no growth in

Falling natural gas prices



Source: State of the market report 2015, FERC, Mar 2016

Lower wholesale electricity prices



Source: State of the market report 2015, FERC, Mar 2016

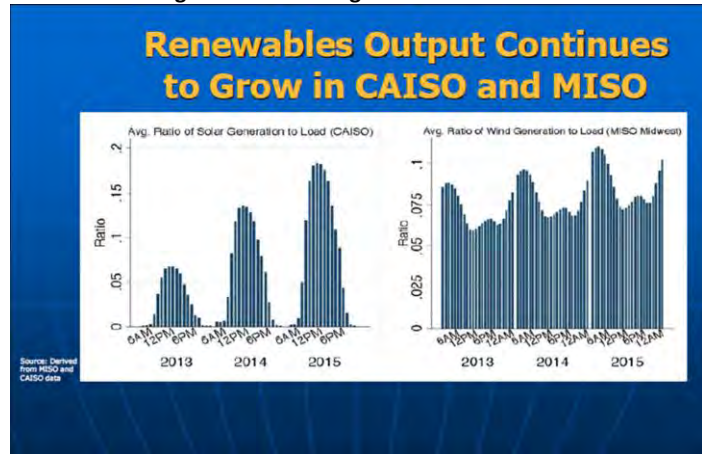
overall electricity demand, the prospects are not good for thermal generators, especially **coal** given the additional restrictions proposed by the **Environmental Protection Agency (EPA)** – currently held in limbo due to court challenges.

Making matters worse for distribution utilities whose traditional business model depends on increased volumetric consumption at regulated tariffs, is the gradual rise of **distributed energy resources** or DERs – which includes increased investments in **energy efficiency** plus **distributed self-generation**, principally from rooftop solar PVs in states with generous **net energy metering** laws (figure on page 7), further explained in the following article.

FERC notes that

— ...total electric energy sold back to utility companies by **net metering customers** nationwide has increased by an average of 500% from 2011 through 2015, while the net generation by power plants nationwide has increased by an average of 1.2% over that span.”

Renewables not good for thermal generators



Source: State of the market report 2015, FERC, Mar 2016

In state of **New York**, for example, NYSERDA estimates the residential PV potential of 881 MW and 2,836 GWhs of generation by 2020 – and NY is not the sunniest place in the country.

The growth of distributed solar PVs is far more pronounced in the state of **California**, currently home to roughly ½ of all US solar installations. Making matters worse for traditional utilities, FERC notes that,

— ...in July 2015, CAISO approved a plan that made it the first US wholesale power market to allow aggregators of distributed energy resources to sell into the wholesale market, although this

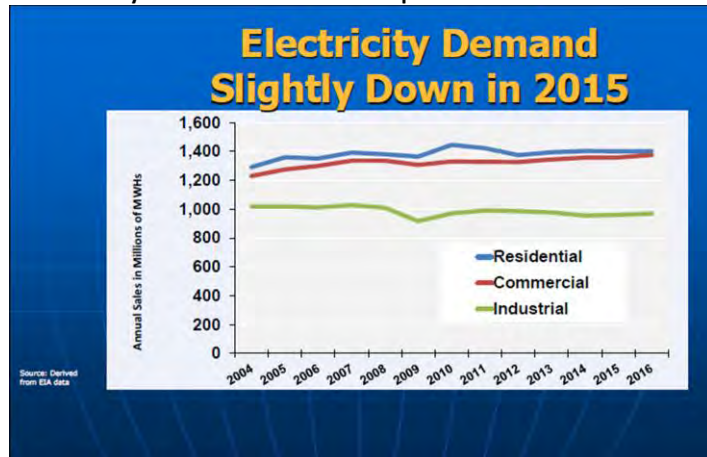
matter is currently pending before this (Public Utility) Commission.—

Moreover, FERC correctly noted that.

—More recently, the **California Public Utility Commission** voted to sustain the net metering credit at the retail rate until 2019,” as described in the March 2016 issue of this newsletter

The implications are clear. Little overall electricity demand growth, rising renewables, plentiful and cheap natural gas and continued rise of distributed energy resources are likely to make life miserable for thermal generators, especially coal, and even more dismal for traditional utilities who confront rising costs and declining net sales to customers.

US electricity demand: Flat as a Kansas prairie



Source: State of the market report 2015, FERC, Mar 2016

In the meantime, capacity prices in eastern US markets, which have **capacity markets**, has risen, increasingly diverging from wholesale prices.

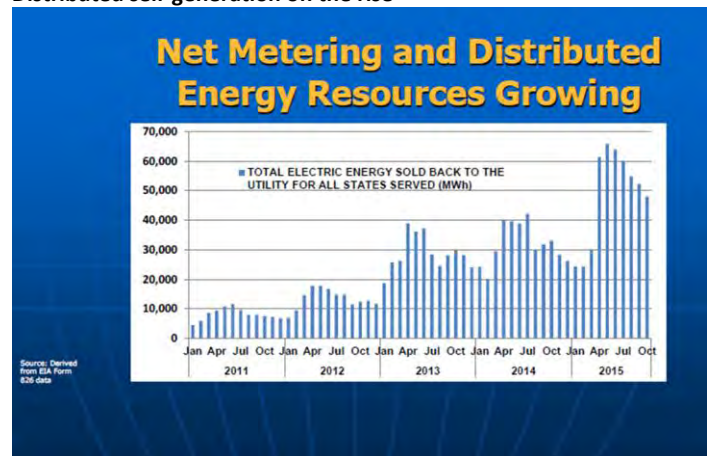
Clearly, being a thermal generator is not as lucrative as it used to be, especially if there is no capacity mechanism to keep some of the unneeded capacity on line.

The issues raised by FERC in its latest state of the market report have, of course, been identified by market operators across the US who confront them to varying degrees. An article in the April 2016 issue of this newsletter, for example, highlighted the challenges facing **ISO New England**.

This is a worrying phenomenon, and not limited to US markets. As described in the April issue of this newsletter, **Germany** and other markets around the world are experiencing similar pressures – little or no demand growth combined with more renewables and more DERs – are all grappling with similar problems, to varying degrees.

As noted by **Malcolm Keay of Oxford Inst. for Energy Studies** in the April 2016 issue, there is now wide recognition that the existing electricity markets are indeed broken – for example they offer little incentive for investing in new capacity when faced with a flood of mandated renewables or subsidized DERs – but less agreement on what is the proper fix. ■

Distributed self-generation on the rise



Source: State of the market report 2015, FERC, Mar 2016

Market Report

Rooftop Solar Casting A Shadow On Utility Revenues

A small blip on the radar screen turns out to be a growing superjumbo

Attending a gathering of utility executives these days in America one cannot escape hearing the constant gripe of lost revenues from pesky solar PV installers and the damage of the prevailing **net energy metering** laws that has resulted in a flourishing market – at least for the better managed ones. As noted by FERC in the preceding article, — ...electric energy sold to back to utility companies by **net metering customers** nationwide has increased by an average of 500% from 2011 through 2015,” while overall electricity sales have remained virtually flat if not declining.

A recent study by **ICF International**, a consultancy, claims that rooftop solar could cut as much as \$2 billion in revenues for generators in the Eastern US alone. It said,

Sun does not shine just on the roof

Not only the roof, but the windows and side panels of buildings will soon be solar covered by PV panels in what is called building integrated PVs or BIPVs. Add a bit of storage, and bingo!



Source: Lawrence Berkeley National Laboratory's FLEXLAB

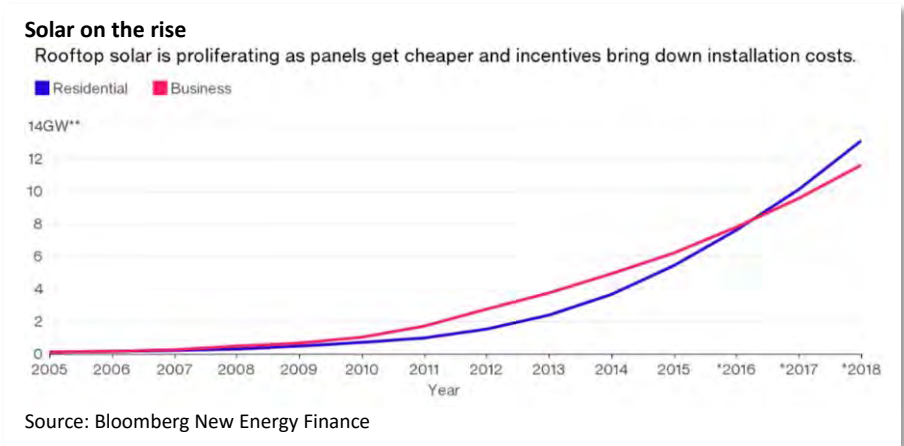
—With more than a million US houses set to have solar panels by the end of next month, grid managers serving the eastern US plan to cut the amount of electricity they buy from conventional plants by about 1,400 MWhrs starting in 2019.”

It is another blow to thermal generators who may curtail future investment in conventional power plants as has already happened in **Germany**, according to **George Katsigiannakis**, a principal at ICF.

Revenue from electricity sales in the US *fell* 1.3% last year to \$388.1 billion, while the industry retired almost 18 GW of

generation, according to the **Energy Information Administration**. A decision by the grid operators to factor in power from rooftop solar arrays in the future would be "a double punch on the conventional power plants," according to Katsigiannakis.

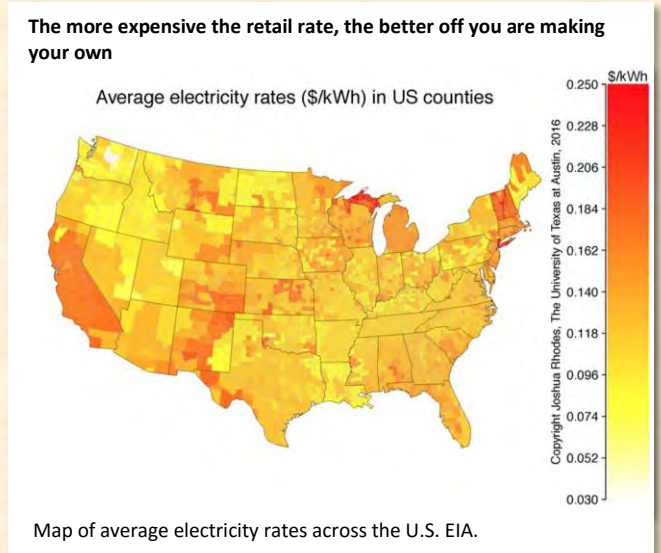
As reported by **Bloomberg**, "It's certainly possible to see rooftop solar growing to a level where it becomes a serious issue for regulated utilities and merchant generators," said **Swami Venkataraman**, vice president and senior credit officer for infrastructure finance at **Moody's Investors Service Inc.** "It compounds all the other issues if solar is also going to cause demand to go down."



Solar grid parity: Are we there yet?

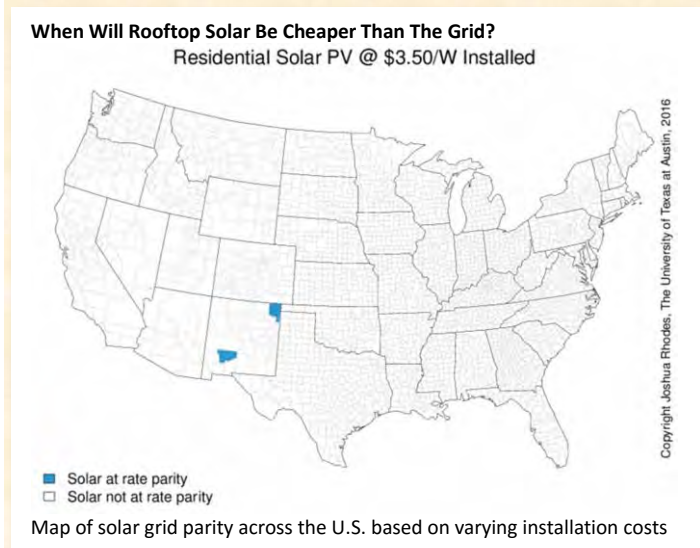
For some time, we've been told that **solar grid parity** is near, or already here. If it is not here, it certainly is very near – that is if you live anywhere where electricity retails above 12.2 cents/kWh. That is because avg. cost of solar generated electricity from rooftop PV is estimated around 12.2. Hence if you live in a place where juice is more expensive, you can make some of your own and save money. There are a few complications, of course, such as you would have to come up with the money to invest in the panels – or lease them.

Setting aside these issues for the moment, and looking at the map on right, it is clear where solar PVs make reasonable sense – dark color parts of the US. And of course the sunnier the region, the more juice you would expect from the panels, all else being equal.



There are easy tools to find out if making your own juice is worthwhile or not, by taking into account the cost of panels, retail electricity prices and average annual solar insolation – all of which are known. For example, the map on top of page 9 shows the **levelized cost of electricity (LOCE)** across the US assuming solar panels at \$3.50/W

installed. By most estimates, today's installation costs are far below \$3.50, perhaps closer to \$2.00/W and rapidly falling. That means that in many parts of America, solar PVs are already at grid parity with more to follow.



Map on left is a GIF that shows solar grid parity assuming that PV owners are paid for their PV generation at the prevailing retail rates, i.e., **net metering scheme** applies, and include the federal investment tax credit (ITC) and applicable local rebates and tax incentives.

The results vary from state to state and from one utility service area to another.

The results would change if net metering laws did not apply or the credit for excess generation were no longer available or at a reduced rates, recently happened in state of Nevada. ■

<http://www.renewableenergyworld.com/articles/2016/04/when-will-rooftop-solar-be-cheaper-than-the-grid-here-s-a-map.html?cmpid=renewablesolar0492016&eid=325185614&bid=1363260>

Utility's lost revenues, of course, end up as savings to retail customers who invest or lease solar PVs. According to the **Solar Energy Industries Association (SEIA)**, last year, the average solar customer generated enough electricity to meet 80% of the average household's electricity needs. Clearly one party's loss is another's gain.

Net energy metering is prevalent in all but a handful of states – while many regulators are reducing or removing the incentives prompted by utilities who say the current generous schemes are unfair to non-solar customers. ■

[Bloomberg Report](#)

What's New? Energy As A Service

In today's complex energy landscape, back to basics may just work

Electricity demand has stopped growing (box below), utility revenues from sales to customers are flat or falling as reported in the preceding article, and customers are increasingly investing in **energy efficiency** and **distributed self-generation** further eroding utility revenues. So what are incumbent utilities doing to survive a seemingly bleak future?

The answer, of course, depends on where you are and whom you ask. Some utilities have belatedly come to the realization that they need to reinvent themselves not only to *survive* but in fact to *thrive* in what may seem like a bleak and challenging business environment.

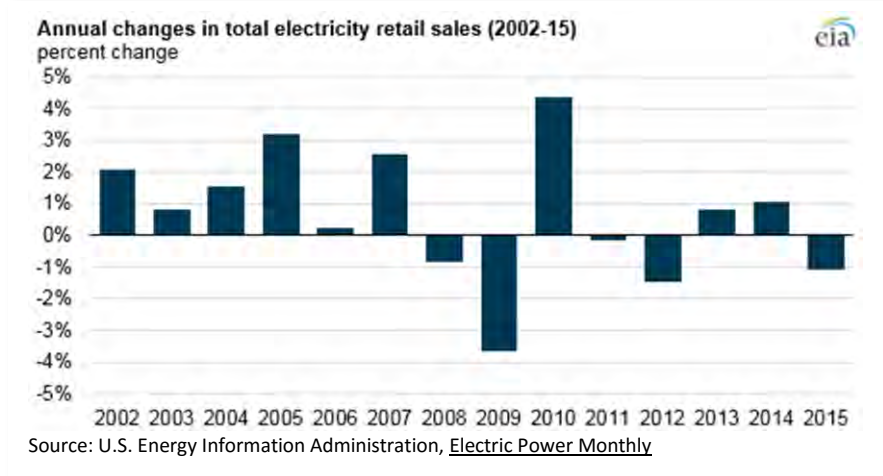
What do you mean? US electricity demand is not growing?

In March 2016, the **Energy Information Administration (EIA)** reported that total US electricity sales in 2015 *fell* 1.1% from the previous year, marking the **5th time in the past 8 years** that electricity sales have *fallen*. While the decline in sales is not alarming, the sheer fact that is not consistently growing as it used to, is a major source of

concern for regulated utilities and their investors.

The flattening of total electricity sales reflects declining sales in the **industrial** sector and little or no growth in **residential** and **commercial** sectors, despite growth in the number of households and growth in commercial building space.

In explaining the trends, EIA attributed the declining rates of electricity demand growth to the usual suspects: market saturation, increasing efficiency of electricity-using devices, a slowing rate of economic growth, and the changing composition of the US economy including the virtual disappearance of electricity-intensive manufacturing and heavy industry. ■

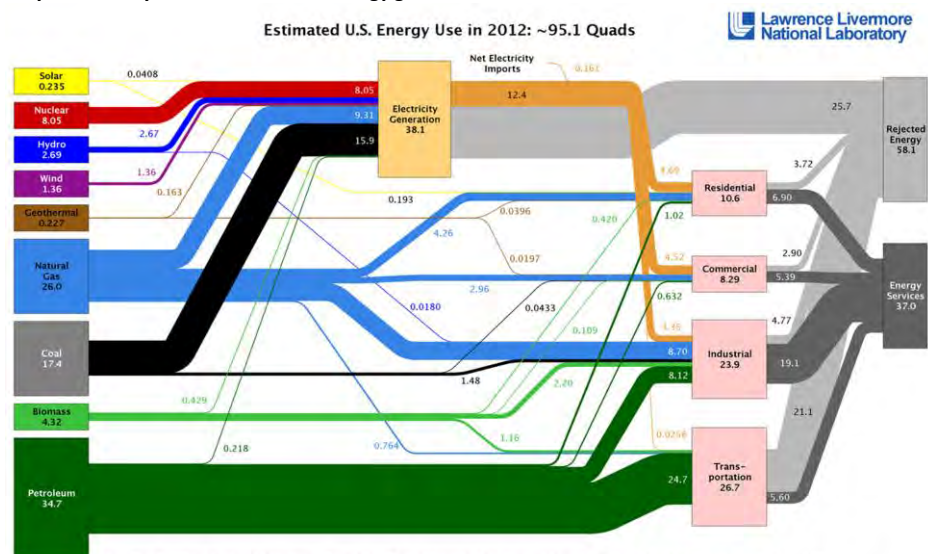


The key ingredients of success in this challenging environment are to

- Recognize that the success of any business depends on the success of its core customers; and
- Success in the rapidly evolving energy business requires dedicated focus to meet the customers' basic **energy service needs** effectively, efficiently, and increasingly in sustainable ways.

It is that simple. And in late March 2019, **Edison International**, the parent of **Southern California Edison Company** (SCE) announced that it was launching a new business unit called **Edison Energy** focused on the notion of delivering *energy as a service* – rather than selling energy as a commodity.

Do you have any idea where all that energy goes?



Source: U.S. Energy Information Administration, [Electric Power Monthly](#)

According to **Ted Craver**, CEO of Edison International,

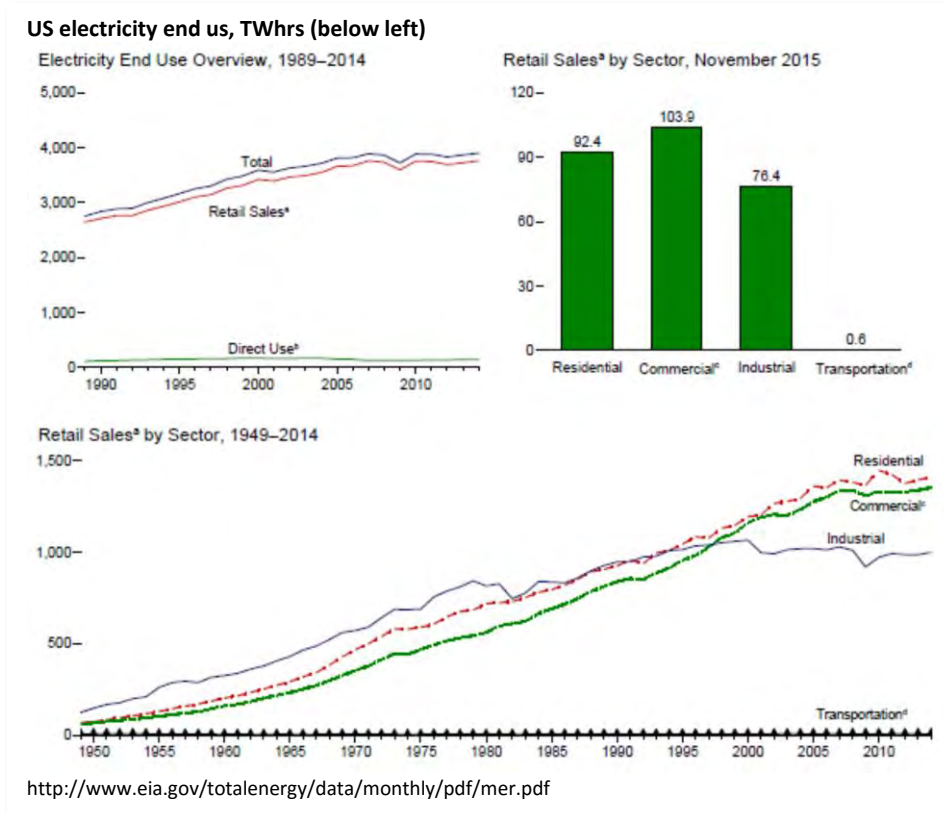
—... gone are the days of simply taking power and paying the going rate. Distributed generation and distributed storage have taken on central roles in corporate energy management—especially as a means of reducing energy costs—but that means a new array of challenges

that non-energy firms aren't well positioned to meet."

Edison Energy is trying to reinvent the energy business by identifying and exploiting opportunities to lower energy costs, reduce complexity of energy management, and meet the basic needs of large **commercial and industrial** (C&I) customers. As a non-regulated entity, the new enterprise is free to serve clients where ever it can find them, and not just within the parent's service area in Southern California. Nor is it limited in the range of products or services it can offer.

—Large energy users increasingly need a strategic partner to help them navigate through the diverse energy marketplace," Craver said, something Edison Energy aims to fill.

To illustrate the challenges facing customers in today's complex business environment, Edison Energy released the results of a survey of some 500 large C&I customers, 24% of whom said they did *not* have a clear idea how much energy the company consumed and why.

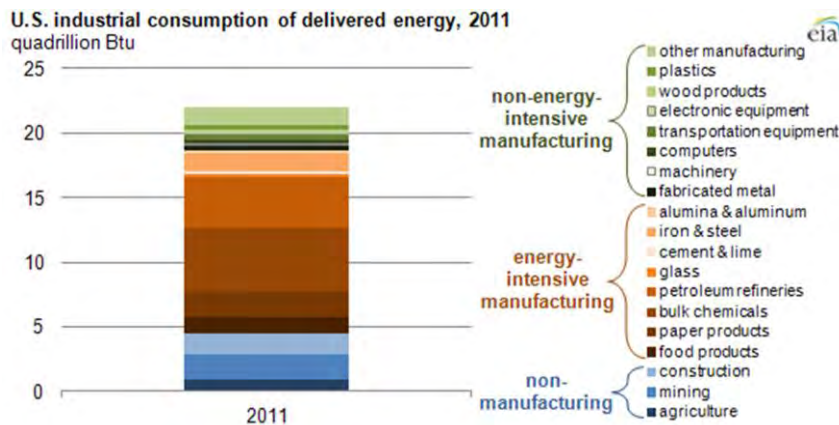


Commenting on this finding, **Allan Schurr**, president of Edison Energy said, —It's hard for corporate energy managers to even know how well they're doing." Another salient part of the survey found that 41% of the companies cited the lack of a *reliable* or *trustworthy* partner as a major barrier in making necessary energy investments – be it in energy efficiency, renewable energy, self-generation, improved energy management or sustainability schemes.

While most energy intensive industrial customers may have savvy energy managers who eke high productivity and efficiency out of every unit of energy consumed, most medium to large C&I customers probably operate far from the optimal point in terms of energy input to product output efficiency. They tend to be mostly focused on the complexities of meeting their own customers' exacting and constantly changing needs. This leaves little time or resources to focus on the energy component of the business.

The problem is magnified by large corporations operating facilities in multiple locations in different parts of the country, or the world, facing different tariffs, regulations, safety, environmental and labor compliance regulations. Often times, there is no spare budget for energy-related investments, training or operational improvements.

How big is the scale of business? US C&I customers are estimated to spend some \$237 Billion annually on electricity and natural gas alone, excluding oil, gasoline, coal and other fuels. And it is estimated that



Source: U.S. Energy Information Administration, Annual Energy Outlook 2012.

much of the money spent on energy is *not* efficiently utilized – a polite way of saying it is *wasted*. It is hard to know how much is wasted but some studies suggest that as much as a third may be inefficiently used. Even if a fraction of that can be saved, it would be a staggering amount.

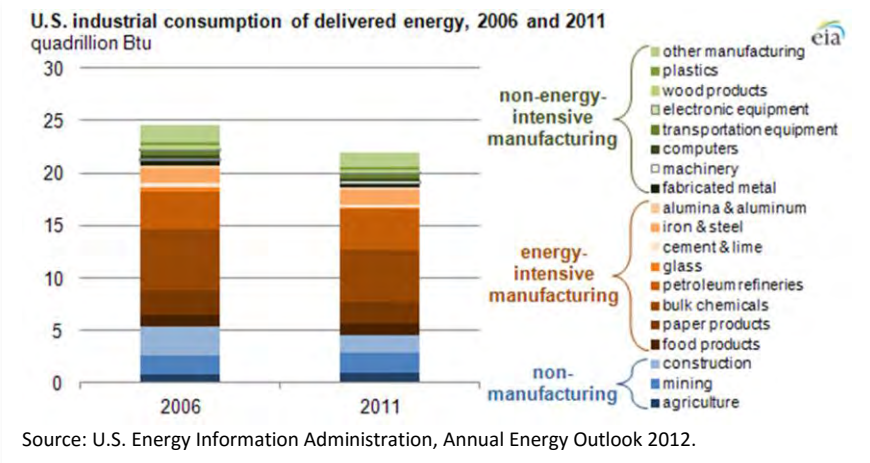
What is the potential scale of energy efficiency savings across the US economy? Studies by **Lawrence**

Berkeley National Laboratory and others put the figure at \$71-133 billion depending on how you do the numbers. Revenues of US **energy service companies** (ESCOs), around \$6 billion in 2013, is projected to reach \$11-15 billion by 2020 – suggesting that the growth potential is substantial.

Would Edison Energy’s new venture succeed? Hordes of ESCOs have tried in the past – some succeeding on small scale and in niche areas such as building energy retrofits, lighting overhauls, boilers, **combined heat and power** (CHP) and similar areas. Others have focused on individual businesses, hospitals, shopping centers, office buildings, which explains why the US ESCO industry is so heavily fragmented.

Moreover, Edison Energy is not the first in this space, but the company's experience and significant resources could make it a national player.

As noted by **GTM's Mulherkar**, the company’s — ...ffort to become the advisor for a large C&I energy user at every step of the value chain ... (including) procurement, consulting, design, build, financing, or owning and operating ...” could make a difference compared to the limited success of ESCOs of the past.



Source: U.S. Energy Information Administration, Annual Energy Outlook 2012.

What Edison Energy is attempting to pull off is a tall order. But C&I customers are increasingly looking for efficient solutions that meets their basic *energy service needs* and for a trusted partner who understands today’s complex and changing energy landscape. The idea of *energy as a service* sounds ripe for the time.

Moreover, the traditional utility business model appears to have outlived its usefulness as the following article explains. ■

[Edison Energy Website & PR](#)

Accenture: Traditional Distribution Model Not Fit For Purpose

Old ways of doing business not as lucrative as they used to be

Consulting companies must find compelling reasons to engage their customers. For many, the starting point is a *survey* that identifies a serious problem, a missed opportunity, a major threat or disruption to their business-as-usual livelihood. **Accenture** delivers one such punch every now and then. Its latest survey of global utility executives concludes that traditional electricity distribution model is *no longer fit for purpose* – that according to 45% of utility industry executives surveyed.

Unless the industry undergoes a “digital, regulatory, and business model transformation,” it will face “increasing pressure on supply reliability and prices,” according to Accenture.

Remember when it was really cool to have one of these devices?



Source: Wireless: the next generation, The Economist, 20 Feb 2016

Accenture’s survey of 85 industry executives from 18 countries identified the rapid proliferation of **distributed generation** as a key challenge for utilities. Some 56% of the executives expect **grid faults** to increase by 2020 as a result of distributed renewable generation, such as **residential solar PVs**. Improving economics of **electricity storage** could be the next major disruptor.

According to **Stephanie Jamison**, Accenture’s global managing director for Smart Grid Services,

“As consumers invest in residential storage and are able to use stored electricity instead of purchasing it from the grid at times of peak demand and price, distribution businesses will face a decrease in demand and consumption on their network. This will impact the utilization of grid resources, putting revenues at risk.”

“Utilities recognize that PV plus storage represents an existential threat to their businesses if they don’t get into the game early.”

Not surprisingly, 77% are already investing or plan to invest in **storage solutions** in the next 10 years.

“While storage could trigger an additional disruptive deployment of small-scale renewables, it also has the potential to improve grid operations. If deployed across the network, it could reduce grid faults caused by renewable electricity exports, where large amounts of excess distributed generation are dumped on the grid at times of low demand and high output,” according to Jamison, adding, “What is more, our modeling showed that relatively small-scale network storage is enough to reduce exports to the grid from a typical residential PV system by 50%.”

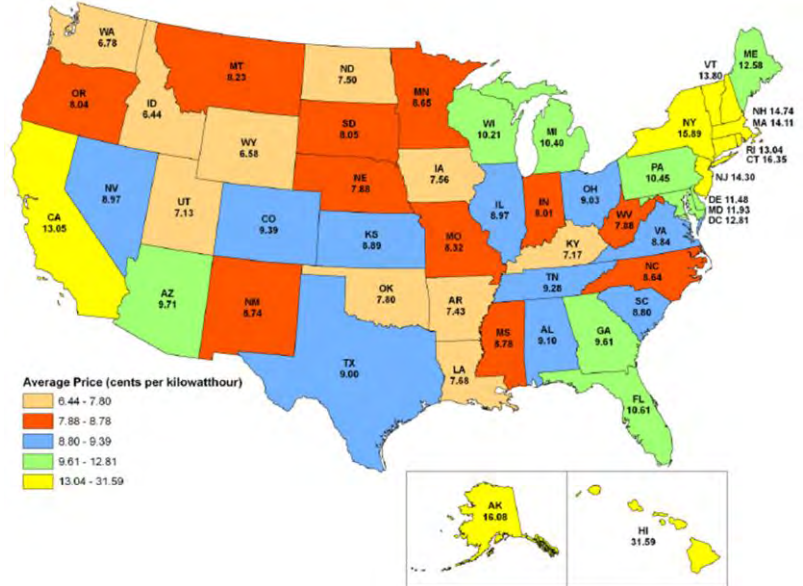
Investing in storage solutions could create new revenue opportunities for utilities, a statement supported by 47% of the executives surveyed expecting moderate or significant revenue upside from these investments by 2030. That explains why almost half of those surveyed expect to be offering network-level storage services including **customer residential storage services** such as maintenance.

To reap storage deployment benefits, utilities need to transform the role of their distribution business. Yet, most utilities are still at early stages or hesitating, citing regulatory obstacles as the main roadblock.

Executives believe that the top three regulatory changes required include

- **New tariff** and pricing models (84%);
- A greater role for distribution businesses in permitting and authorizing **distributed energy resource** connections (66%); and
- **Incentives** for the deployment of innovative technologies on the network (64%).

The higher the retail tariffs, the more competition from DERs
Avg. retail rates, cents/kWh



Source: EPA

According to Jamison,

"We expect a fundamental shift of the market structure, which will include greater use of competitive markets, but utilities and distribution businesses need to push the boundaries, collaborate with regulators to innovate, and strategically invest in solutions that will support a more digital and distributed grid, providing new choices and value streams for customers." ■

[Accenture Report](#)

Want More DERs? Make It Win-Win For Customers And Utilities

One California regulator floats an interesting proposal

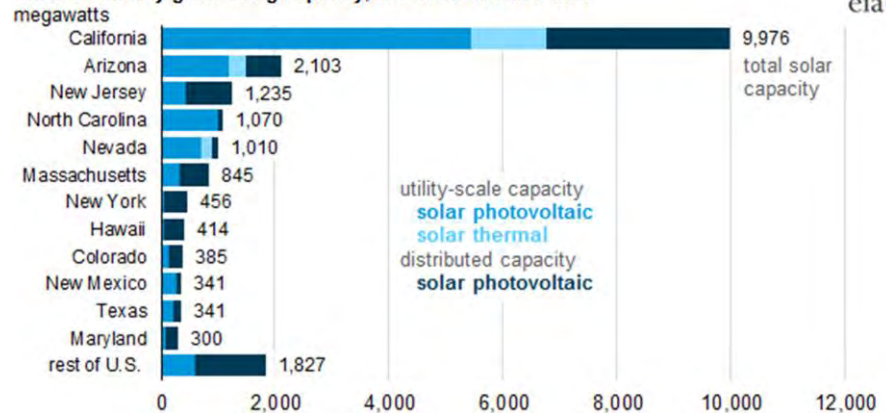
Utilities use to have it easy. They invested in infrastructure and earned a reasonable rate of return on whatever was in the so-called **rate-base**. Growing sales kept the tariffs low, further encouraging consumption. While consumers are still using lots of kWhs, it is no longer growing as it used to. Moreover, some consumers have found ways to using less while generating some of what they use – which explains the growth of **distributed energy resources** or DERs – explained in the prior 2 articles.

DERs may be good for the customers, the environment and possibly even for the utilities – although very few utility executives we know will buy that. Most see the business as a zero-sum game. If consumers invest in energy efficiency and/or self-generation, that reduces their sales and revenues. How could DERs remotely be good for them?

Moreover, many utilities are not convinced that DERs helps reduce their distribution network investments – and even if it did, how can that possibly be good for business? This is perhaps the only industry on earth

Solar PVs more prevalent in California

Solar electricity generating capacity, end of November 2015



Source: EIA, *Electric Power Monthly*

that actually benefits from investing *more*, not less. It is called **rate of return regulation**.

Which explains why DERs are not something utility executives would like to see more of. Not only does it cut into their sales and revenues, it potentially reduces the need for making investments in infrastructure, generation, transmission and distribution.

Regulators in a few states where DERs, especially **distributed solar PVs**, are flourishing have belatedly discovered that time may have arrived for them to rethink how utilities should or can be *rewarded* – rather than penalized – for buying DERs from their customers. The thinking, still in its infancy, is to make DERs a win-win for both customers *and* the utilities, or at least a win-no lose proposition.

In April 2016, **Mike Florio**, one of the commissioners at the **California Public Utilities Commission (CPUC)** floated the idea that – perhaps – utilities should be compensated for buying DERs from their customers. If that sounds odd or radical, it certainly is, even for California where nothing seems too odd or radical.

In its 8 April 2016 issue, **California Currents** reported that, —California’s investor-owned utilities could get a 3.5% return on power they buy from distributed resources” *if a proposal* by Commission Florio goes forward. Two key words: *If* and *proposal*.

According to **California Currents**, Florio is not *wedded* to a specific percentage, but he made the proposal because he believes that —utilities might be more amendable to relying on power from small-scale solar systems, fuel cells, or storage systems operated within their distribution networks if they earned a profit” from such schemes. Currently, he noted, —they don’t get any return on investment for purchasing distributed energy, with the cost just being passed through directly to ratepayers.”

—My objective at this point is to determine whether the concept is correct and, if so, how it could be utilized to develop an interim pilot program encouraging the IOUs to pursue cost-effective distributed energy resources.”

Under Florio’s proposal, utilities buying distributed power to avoid upgrading transmission and distribution system infrastructure could earn a modest return as an incentive to buy more distributed energy. Also, by avoiding investments in these other facilities from which they generally earn a higher rate of return, beginning to allow a return on distributed power would *not* result in electricity rate increases.

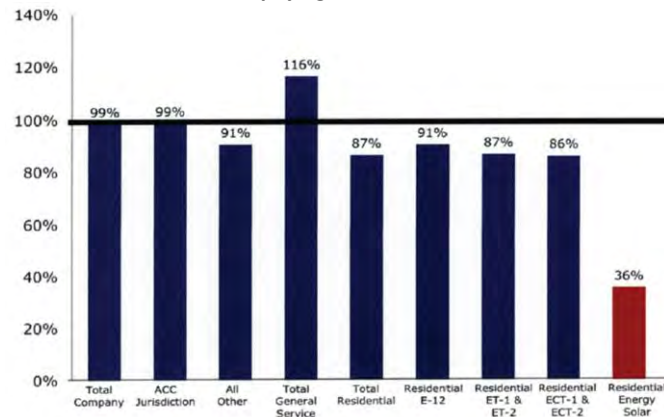
Florio said incentivizing utilities to purchase more distributed power—even after a rate of return—potentially could *lower* rates, which would mark —a win-win” for both utilities and ratepayers.

—If we can pull that off I think it will be a very significant development.”

It is a big if. The surprise proposal surfaced during CPUC's **integrated distributed energy resources** proceeding in early April.

It is by no means a done deal, but it shows that in states such as California, where retail tariffs are high – especially in the upper tiers – and where the prevailing net energy metering laws remain extremely generous, something more or different needs to be done to keep utilities whole. Commissioner Florio's proposal may not be the best way to go, yet it suggests that, moving forward, regulators are looking for win-win solutions. ■

APS: Solar customers not paying fair share of costs



Source: APS filing before ACC

Nuclear Energy: One Step Forward, Two Steps Back?

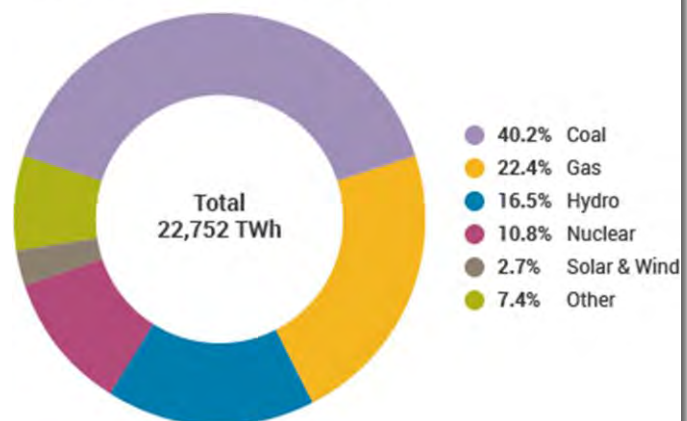
With plentiful renewables and cheap gas who needs nukes

Nuclear generation represents over 10% of global power production (figure below) and enjoys a massive buildup in **China** and a few other places. But investors in America and Europe seem to have had enough of the atom. It comes in big lumps – which is not what you need if demand is not growing – takes too long to build and puts too much capital at risk for private investors.

World Nuclear Association, of course, would rather talk about the good news, such as remind us that 440 commercial nuclear power reactors with 380 GW of capacity operable in 31 countries, with 65 more under construction. That is good news indeed, but looking at the generation figures one cannot miss the fact that it has been in slow decline since 2006 (graph on page 17).

Among the top nuclear powers, **US**, **France** and the **UK** will have a hard time merely maintaining what they currently have while **Japan** – once the No. 3 global player – has virtually dropped off the chart since the **Fukushima accident** in 2011 (graph on page 17) soon to be joined by **Germany**, which is shutting down its remaining reactors by 2022.

World Electricity Production 2012

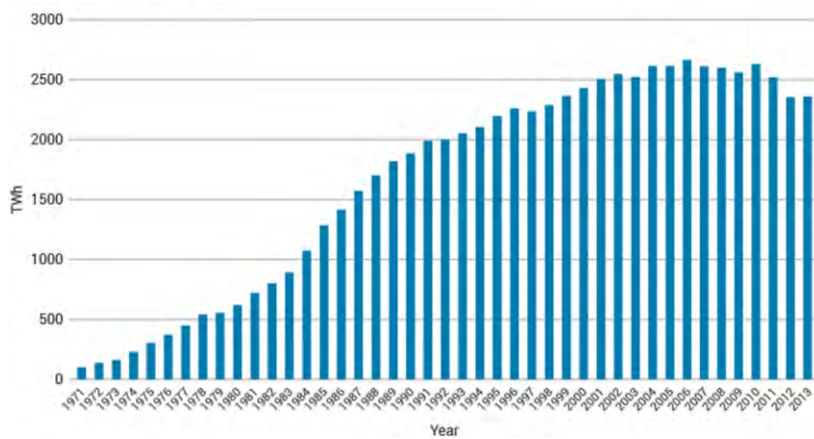


Source: IEA Electricity Information 2014

A number of other countries including **Sweden** and **Switzerland** have said they will not replace their nukes once they retire.

In case of the UK, where the country's aging fleet will reach its useful life by middle of next decade, the government has offered an unusually generous fixed-price guarantee to a French/Chinese consortium to

Nuclear plateau
Nuclear Electricity Production



Source: World Nuclear Association

build **Hinkley Point C**.

But as explained below, the French builder is debating if it can take on a massively complex project while facing debt and financial woes at home

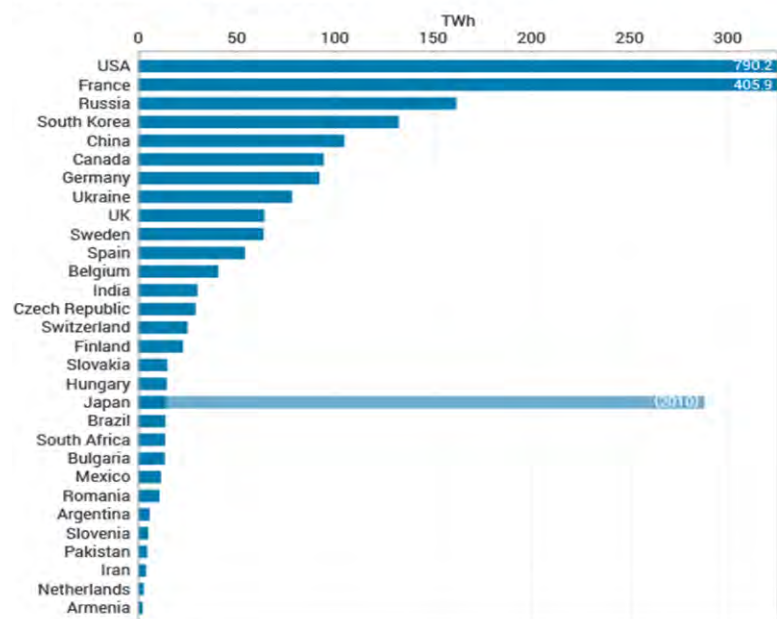
The proposed expansion of the **Hinkley Point** nuclear plant in the UK, a joint project between French-based **Electricity de France** (EDF) and Chinese firm **CGN**, has been in the news with contradictory statements from different

sources saying that it can or cannot proceed, including a statement from EDF’s CEO, who stated that the project *cannot* proceed without additional financial support from the French government.

At a projected cost of £18 billion (\$25.5 billion), it is the most expensive power plant in the world – and more than EDF’s entire current market value. In October 2015, when CGN agreed to take a 33.5% stake in the project, EDF was expected to be able to close the deal. But EDF and its other French-owned partner **AREVA** have fallen on hard times and are reportedly £11 billion short of what is needed to commence construction.

EDF’s CEO **Jean-Bernard Levy**, which is 85% state-owned, has repeatedly asked for additional support from the French government, stating that he continues to believe that Hinkley Point is a “good project” for the company, and presumably the country too.

Nuclear powers less Japan, soon to be joined by Germany’s exist
Nuclear Generation by Country 2013



Source: IAEA PRIS Database

Levy has said EDF needs to come up with more than £16 billion to match the £2 billion it has already spent. The **European Commission** (EC), when it approved the deal in 2014, required EDF and its partners to come up with contingent costs up to £24.5 billion to protect the UK government.

The Hinkley Point C project would add 2 new AREVA-designed **European pressurized reactors** (EPRs) with capacity of 3,200 MW adjacent to the existing Hinkley Point A and B nuclear plants, which are scheduled to retire in the 2020s.

Nuclear's prospects are brightest in centrally-planned economies with rapid demand growth. **China** plans to increase nuclear generating capacity to 58 GW with 30 GW more under construction by 2020. China has completed construction and commenced operation of 28 new nuclear reactors between 2002-15, and some 24 new reactors are under construction including the world's first four **Westinghouse AP1000** units and a demonstration high-temperature gas-cooled reactor plant.

A great project, if only EDF, or France, or UK, could afford it



China is now contemplating to commence export marketing of a largely indigenous reactor design with significant investment in reactor technology R&D. Atom has its proponents in a number of rapidly growing economies who aspire to join the nuclear club. ■

Peer-to-peer On The Grid's Edge

A flurry of innovation, and anticipation, on the grid's edge

Not a week goes by without the news of a new startup attempting to find a profitable niche in the ever expanding space of business opportunities on the grid's edge. While many seem a bit outlandish for this editor's taste, others may just take off – as did companies such as **Google, Facebook, Dropbox, PayPal, eBay, Uber** and **Airbnb** – all underappreciated when they first surfaced and now multibillion success stories.

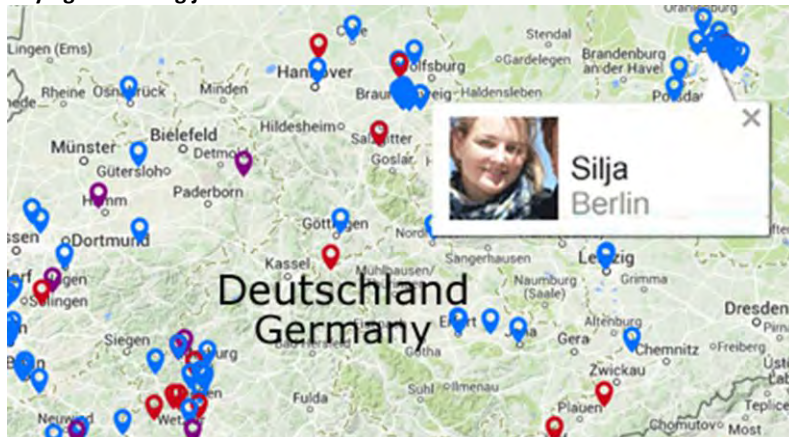
Most are trying to latch on to an existing or emerging technology with broad customer appeal. There are simply too many to cover in an entire newsletter, let alone in a single article. A few are highlighted, not in any particular order or as endorsement of the product or service, but merely as a way of showing how fast the field is growing.

Many fall in the category of **shared economy** concept, such as Airbnb. Take **Brooklyn Microgrid**, which uses a platform called **TransActive Grid** enabling its members to engage in **peer-to-peer trading**. The company's first project will connect houses with solar panels with others who would like to but cannot, perhaps because they do not have a roof.

The company's goal, according to its website <http://brooklynmicrogrid.com>, is to

- Increase the amount of clean, renewable energy generated in the community by members of

Buying and selling juice on the web in Deutschland



Source: Buzzn, <https://www.buzzn.net>

- the community;
- Develop a connected network of **distributed energy resources** (DERs) which will enhance the grid's resiliency and efficiency;
- Manage these DERs in times of power outages and emergencies; and
- Create financial incentives and business models that encourage community investment in their energy future.

There are countless variations of the same theme, like different ice cream flavors.

Matter Technology Ltd. an Australian company, allows landlords to operate like a micro-utility, by selling solar power generated at their rental property back to the tenants for less than what they can buy from the grid. It is targeting Australia's 2.4 million rental properties towards a brighter solar future.

It uses Hana, a software that helps landlords and tenants decide whether the shared solar technology will work for them, using estimates of how much solar power will be consumed, how many panels should be installed, and how to share the value that is created. According to the company,

—Hana provides landlords and tenants who most likely don't know each other, with a way to easily predict and share mutually beneficial value created from ... solar ...”

To do this, it compares data on panel costs, solar production projections, electricity tariffs and the value sharing equation a

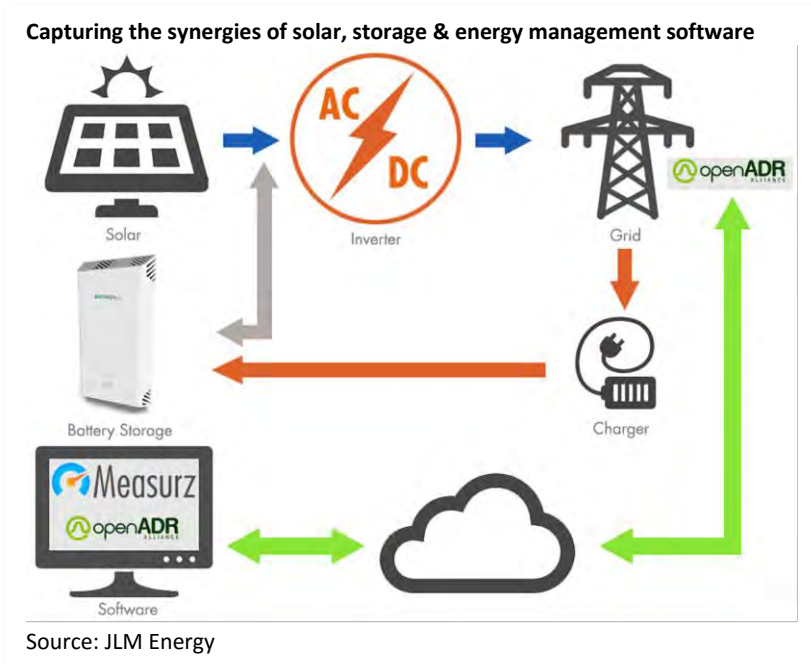
landlord and tenant can agree on. It then estimates expected installation costs, payback period, return on investment and the tenant's savings against their electricity bill.

The saving can be as much as \$300 a year for tenants with an average house with an energy bill of \$1,500 a year; more for a bigger house or one with air-conditioning and/or a pool.

The electricity savings are estimated at \$780 million per annum if all rental properties in Australia took advantage of what is on the offer. For landlords, the scheme pays off within 4-5 years and generates \$1 for every \$5 spent.

According to its CEO, **Chris Mrakas**, —The central premise behind ... (the scheme) is that considerable economic wealth is created when a property investor and a tenant collaborate to share value that comes from displacing grid electricity with distributed solar power.” More at the website <http://www.smartmatter.com/landlords/>

Buzzn, another start-up in Germany buys distributed self-generated electricity from customers or small businesses reselling it to other customers using a web-based exchange – a common feature of nearly all



such schemes. The company’s website (graph on page 18) shows a map where blue flags are customers *buying* and red flags those *selling* electricity.

Others are trying to make better use of energy management and control tools that can improve how energy is used and when, typically combining it with distributed self-generation, storage and/or electric vehicles (EVs). An example of this is **JLM Energy**, which launched **Energizr 200**, a “grid synergistic residential energy storage system, the first of its kind combining solar and energy storage from the ground up,” according to the company’s press release.



Source: JLM Energy

The company’s website declares —**Renewables + Energy Storage + Energy Management Software = Savings.**” Elsewhere it says: —**R**duce your dependence on your utility company and prepare for the savings that follow.”

OK, we get it, you connect your solar panels and storage device through a cloud based system with sophisticated software that maximizes everything and minimizes everything else – and you don’t have to do a thing beyond a few clicks on your mobile phone. In reality, of course, it is never that easy.

JLM Energy’s CEO **Farid Dibachi** claims this is the first time a single product optimally controls solar, storage and energy efficiency. Combining solar with a smart energy management system

makes it possible to rely on stored energy during peak times to lower electric bills.

The fundamentals make sense, but will such schemes flourish, will they make money while delivering consistent and persistent savings to customers?

There are so many companies on the so-called grid’s edge, that **Greentech Media** started picking winner since 2014. In mid April 2016 it announced a list of top 20 companies or projects that have demonstrated the potential to shape tomorrow’s distributed energy system (Table below).

In naming the winners, it said the —... awardees were selected based on their contribution to **grid edge technology transformation**, increasingly critical at a time when utility business models are facing change and more distributed energy resources are coming online.”

According to **Steve Propper**, Director of Grid Edge at Greentech Media, —This year’s group is made up of technology vendors making the greatest impact on the market in terms of *deploying disruptive solutions commercially*. It also includes utilities making smart investments

And 2016 top 20 Grid Edge award winners are ...

1Energy Systems	Opus One
AutoGrid	KCP&L
Blue Pillar	New York Power Authority
BMW Group	OhmConnect
Duke Energy	Olivine Supply Side Pilot
EnergySage & National Grid	Onco Microgrid / S&C Electric
Green Mountain Power	Smarter Grid Solutions
Gridco & Hawaii Electric	sonnenBatterie
Integral Analytics	Steffes Corporation
Itron	Tesla

Source: Greentech Media

to optimize their distribution network architecture and prepare for the future architecture of the grid.”

Who is on the list? Few companies such as **Tesla**, **Itron** or **Green Mountain Power** are well known, others this editor has never heard of.

Perhaps it is time to look up the unfamiliar ones. If they succeed, they may be the next Teslas or Ubers. ■

Solar Paradox

Why are solar companies feeling the pinch when the business is booming?

The U.S. solar market is set to grow a staggering 119% in 2016 on top of a stellar growth in 2015, according to **GTM Research** in its recently released **US Solar Market Insight 2015 Year in Review**, published in conjunction with the **Solar Energy Industries Association (SEIA)**. By 2021, GTM projects US solar market to surpass 100 cumulative GW of capacity, adding roughly 20 GW or more per annum. Led by the utility-scale plants, 16 GW of solar are expected in the US in 2016, more than double the prior record of 7.3 GW installed in 2015.

So why are a handful of solar companies, notably **SunEdison**, seeking bankruptcy protection with other once high-flyers like **SolarCity** suffering from depressed stock prices?

The same can be asked about Spanish **Abengoa**, among a handful of others.

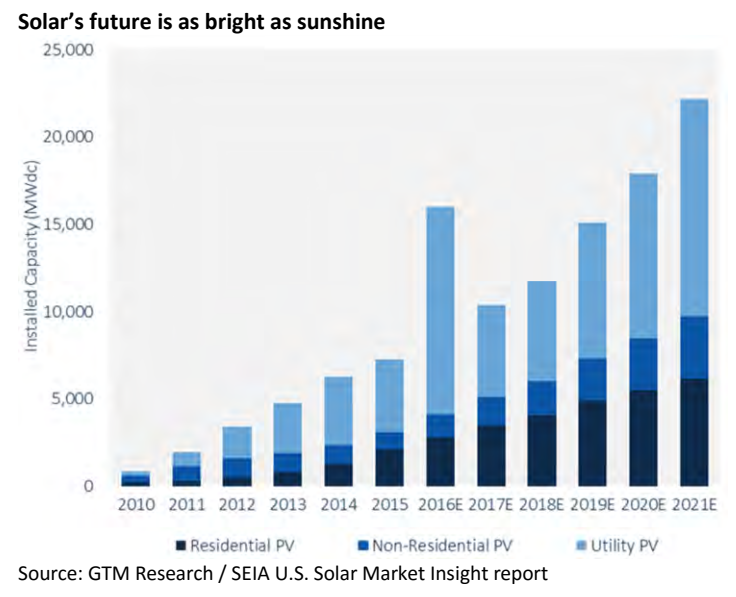
BrightSource Energy's Ivanpah, the world's largest **Centralized Solar Plant (CSP)** in Southern California desert near Las Vegas, has also come under pressure for failing to deliver as much juice as contracted. The plant is reportedly using natural gas to augment the energy it can capture from the sun to boost output – not exactly a renewable resource as was intended. **David Crane**, the former CEO of **NRG Energy** apparently lost his job for pushing solar too fast and perhaps too far.

As reported in the trade press, many of the solar companies feeling the heat only have themselves to blame for expanding too fast, accumulating more debt than their cash flow could sustain, or making too many hasty and/or risky investment decisions when they should have focused on their core competencies.

SunEdison's problems were exacerbated with its decision in mid-2015 to acquire **Vivint Solar** for \$2.2 billion at a time when the company's debt was already excessive. Ditto for Abengoa.

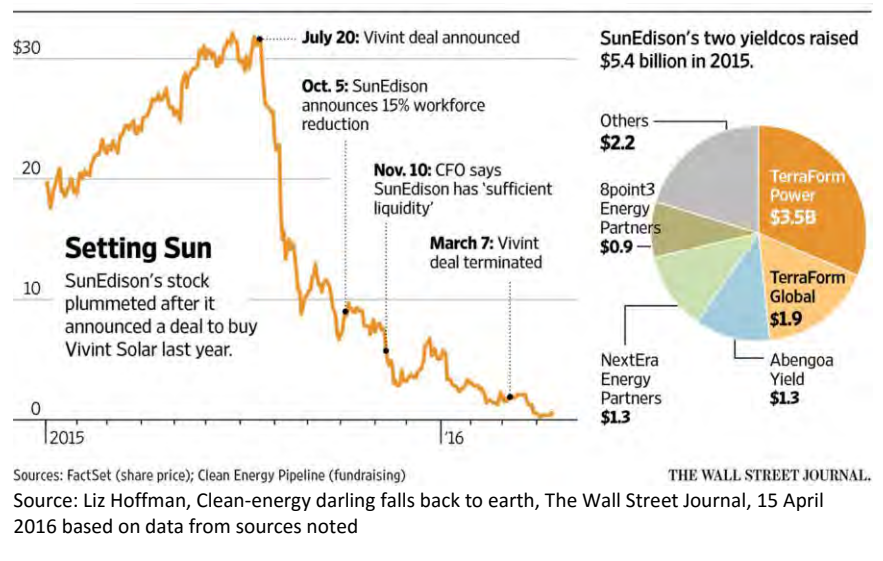
As reported in an article in **The Wall Street Journal** (15 April 2016), SunEdison, once a high flying darling of investors has lost nearly \$10 billion in shareholder value with astonishing speed. Its stock price has been trading below \$1 a share from above \$30 in July 2015 (chart on page 22).

Its flamboyant CEO, **Ahmad Chatila**, who once predicted the company would grow to a \$350 billion



mega enterprise, remains bullish – while few others share his optimism for a quick turnaround. Following months of speculation, the company was forced into bankruptcy protection in late April dragging virtually all solar companies down with it just as **Enron**’s failure tarnished the reputation of all **energy trading** companies.

SolarCity’s lucrative business model has come under pressure – and question – after **Nevada** and **Hawaii** abruptly changed their lucrative **net energy metering (NEM)** laws with a number of other states looking into similar moves. While the affected markets are not huge, say relative to **California**, the regulators’ change of mind and policy has made investors nervous about the longer-term viability of the solar leasing firms, which are overwhelmingly dependent on the prevailing NEM laws, tax credits and other incentives that has made solar leasing such a lucrative business.



Should regulators reduce or remove the credit paid for the *excess* generation, the *net* in NEM, fed into the grid, distributed solar becomes less lucrative for customers – which means less profitable for leasing companies, solar installers and their investors.

Setting aside the problems of solar leasing companies, utility-scale solar is projected to grow. According to **Honeyman of GTM**, —As the double-digit-GW utility PV pipeline is built out in 2016, utility solar is expected to experience a reset in 2017,” noting that the market will shrink to a still-impressive 10 GW level per annum growth. —But between 2018 and 2020, the extension of the **investment tax credit (ITC)** will reboot market growth for utility PV and support continued growth in distributed solar as a growing number of states reach grid parity.”

Forgetting about simple cash flow



The Spectrum Solar Project in Las Vegas was developed by SunEdison Inc. PHOTO: STEVE PROEHLCORBIS

Source: Source: Liz Hoffman, Clean-energy darling falls back to earth, The Wall Street Journal, 15 April 2016 from Steve Proehlcobis photo

The federal ITC provides a 30% tax incentive on all solar projects. In December 2015, Congress extended the credit out to 2019 with a step-down through 2022 and project completion deadline of 2023 for some projects. ■

[WSJ Article](#)

Coal's Headwinds Will Only Get Worse And Spread Beyond The West

Shunned in the West, increasingly unloved elsewhere

Some cultures believe 13 is an unlucky number while others think the opposite. On 13 April 2016, **Peabody Energy**, the world's largest private sector coal mining company, filed for Chapter 11 bankruptcy. Environmentalist and the anti-coal lobby cheered, celebrating the milestone as a turning point for banks and financial institutions to move away from making future investments in dirty and polluting energy sources to carbon-free and more sustainable resources.

The company, founded in 1883 by **Francis Peabody**, reportedly with \$100, a wagon and 2 stubborn mules, grew to become a multinational giant. At its zenith in 2011, it had market capitalization of \$20 billion, operating in 25 countries. It is now worth a mere \$38 million, if that.

It is not the first coal mining company to file on hard times, nor the last. **Arch Coal Inc.**, **Alpha Natural Resources Inc.**, **Patriot Coal Corp.** and **Walter Energy Inc.** have also filed for bankruptcy protection. More are likely to follow, and not just in the US.

The pressure on coal, which has been on for a while, is only intensifying. In March 2016, under intense pressure from the **Rainforest Action Network** (RAN) and similarly-minded organizations, **JP Morgan Chase** agreed to join a growing number of banks who are moving away from coal.

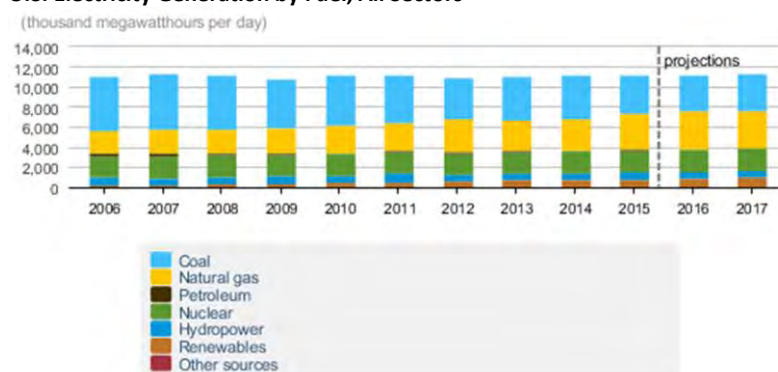
JP Morgan has promised a transition *away* from the financing of new coal mines responding to, among others, a passionate plea by **Anote Tong**, the president of the vulnerable small island nation of **Kiribati**, for a global moratorium on new coal mines.

At last count, 5 out of the 6 largest US investment banks, **Bank of America**, **Citigroup**, **Morgan Stanley** and **Wells Fargo** have agreed to move away from financing coal mining.

The news keeps getting worse for coal miners. In March 2016, the **Oregon Senate** passed a bill, subsequently signed by Gov. **Kate Brown**, which will require electric companies in the state to eliminate coal-fired generation from their electricity supplies by 2030. The same bill raises the state's **renewable portfolio standard** (RPS) to 25% by 2025.

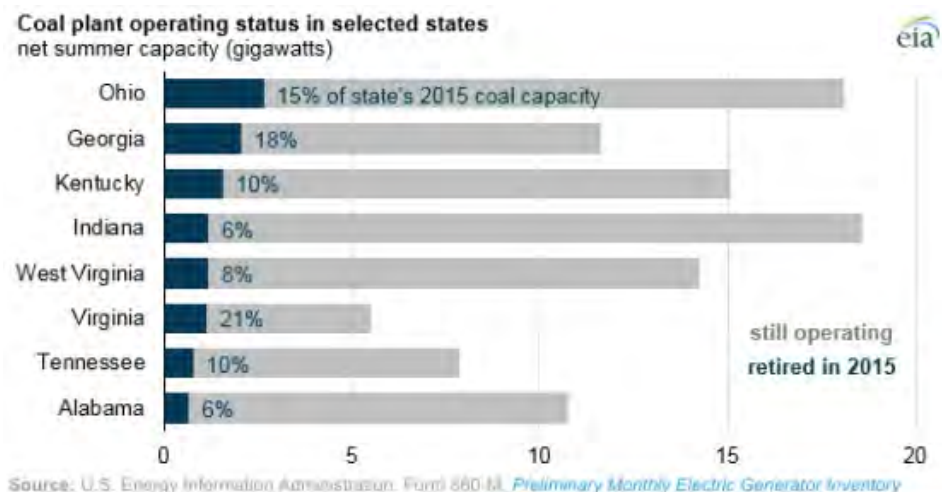
Across the US, coal continues to lose market share to cheap and plentiful natural gas, and increasingly renewables.

U.S. Electricity Generation by Fuel, All Sectors



Of nearly 18 GW of US generating capacity permanently retired in 2015, 77% was conventional steam coal-fired. About 30% of that was retired when the **Environmental Protection Agency's** (EPA's) **Mercury and Air Toxics Standards** (MATS) rule went into effect, according to the **Energy Information Administration** (EIA), with more to follow.

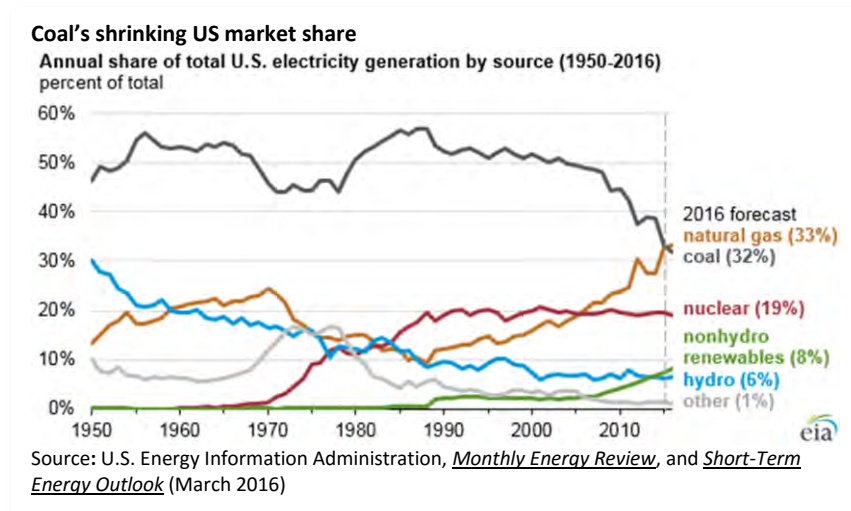
According to the EIA, the coal units that retired, mostly in **Ohio, Georgia and Kentucky** (chart on right) were built between 1950 and 1970 with an average age of 54 years compared to 38 for the coal fleet that continues to operate, and much smaller, less efficient and more polluting.



EIA data shows a near tie for gas and coal in 2015 with coal generating 1,356 TWh or 33.2% share, while gas-fired generation produced 1,335 TWh or 32.7% of the total. While nobody sees the end of coal any time soon, the long-term trends are hard to miss (graph below).

Nor is the pressure on coal limited to the US. The government of **UK**, and **Alberta** are moving away from coal. A recent study by **Barclays** predicted that the 46 GW of black and brown coal fired generation currently in service in **Germany** will be *worthless* in little more than a decade if the country adopts the targets embraced at the Paris climate change conference.

According to energy analyst **Mark Lewis**, German coal fired power generation would have to be almost completely eliminated by 2030 in a scenario that would require a substantial carbon price (€45/t) and the end to the current energy market design.



Many in the fossil fuel industry, of course, are in denial, shock, disbelief or all of the above. They simply refuse to acknowledge the trends, the increasing pressure on carbon, and the rapid rise of renewables. Some prefer to dismiss last **December's Paris climate agreement** as a —del-good” gathering with no enforcement mechanism and no lasting impact on global emissions.

The environmental community, however,

believes otherwise. On **Earth Day**, 22 April at the **United Nations** in New York, 175 countries formally signed the agreement reached in Paris in Dec 2015 – it was a historic diplomatic record for the number of signatories to an international treaty on the first available day.

The fate of coal, of course, will be decided not in **Oregon**, the **US**, **Germany**, or by the UN but in rapidly growing economies of **China, India, Pakistan, Indonesia, South Africa**, to name a few. And on this context, there has been surprising news coming from China, which accounts for roughly half of global coal consumption.

Recent data suggests that China's electricity sector transformation is gaining momentum much faster than many had anticipated, with electricity consumption up just 0.3% year on year for the January-February 2016 period while, coal imports *fell* 10.2% and coal production *declined* 6.4%.

What lies behind this stunning turnaround? According to **Tim Buckley, IEEFA's Director of Energy Finance Studies**, —Slowing economic growth, reduced energy intensity of economic activity and a rapid diversification in electricity towards renewables, nuclear and hydro electricity generation are combining to rapidly unwind China's historic dependence on coal.”

Moreover, there are signs that China's electricity consumption may be *decoupling* from its economic growth, like other advanced economies, at the same time that its economy no longer grows at double digit rates.

The other but equally important factor is the rapid growth of renewables. A record 32 GW of wind and 18 GW of solar capacity was installed in 2015 alone as China continues to diversify its electricity generation mix away from over-reliance on highly polluting coal.

IEEFA believes that China's coal-fired generation peaked at 79% of total in 2011, dropping to 70% in 2015, and on track to drop another 2% share in 2016 falling to below 60% by the decade's end, consistent with the government's target of just 50-55% by 2030.

Table 1: China's Electricity Generation (TWh pa)

Year end December (TWh)	2014	2015	% Chg	TWh Chg	% share 2014	% share 2015
Thermal generation	4,359.7	4,242.0	-2.7%	-117.7	75.3%	73.0%
Hydro generation	1,072.8	1,126.4	5.0%	53.6	18.5%	19.4%
Nuclear generation	132.5	170.8	28.9%	38.3	2.3%	2.9%
Renewable generation	228.2	271.4	18.9%	43.2	3.9%	4.7%
Total Generation (TWh)	5,793.2	5,810.6	0.3%	17.4	100.0%	100.0%

Source: China's National Bureau of Statistics, IEEFA calculations

And if China can move away from coal at such a rapid pace, so can everybody else. ■

Renewables: Variable, Not Intermittent

Ben Elliston a subscriber from Australia objected to the use of the term —“intermittent” in referring to renewables. He wrote, —“I know you don't mean to use this in a pejorative way, but this term has crept into common use, and it is unfortunate,” adding, —“It is inaccurate and now actively used by those opposed to renewable energy.”

—“Various dictionaries define 'intermittent' as "stopping and starting repeatedly” or "alternately ceasing and beginning again". Of course, that is not what wind and solar PV generators do. They produce power in a variable and somewhat unpredictable fashion, but with high reliability. Even in high cut-out wind conditions, modern wind turbines no longer abruptly cut out.”

—“I hope you can use the more accurate term "variable renewables" in future.”

Dr. Ben Elliston,
University of NSW

Book Review: *Future of Utilities: Utilities of the Future*

How Technological innovations in distributed energy resources will reshape the electric power sector

Edited by Fereidoon P. Sioshansi

Published by Elsevier, April 2016, Paperback, 467 pages, ISBN: 978-0-12-804249-6

List price: \$100.00

Roger Lilley, the Editor of *Energize*, a South African publication, has published a review of this editor's latest book, which appeared in 24 Mar 2016 issue of the publication. It is reproduced below with minor abbreviation, or can be viewed in its entirety from the source <http://www.ee.co.za/article/future-electric-utilities-discussed.html>

The electric utility business, which was mostly stable and predictable in the past, is now seeing similar technological and societal challenges as were experienced by the mainframe computer industry in the 1980s and the film camera industry in the 1990s; namely the need to adapt to modern technologies and customer demands.

There are many who believe that the electric power sector is entering, or has already entered, a new phase in its evolution, requiring significant changes in its operations, business model, culture, and how it is regulated. The debate about the future of the power industry is heated, with varied opinions on the ultimate outcome. Some suggest the dreaded utility death spiral is here, or near, and the industry is heading into a fatal stall from which there is no escape.

Future of Utilities – Utilities of the future: how technological innovations in distributed energy resources will reshape the electric power sector, edited by Fereidoon P. Sioshansi, provides a view of the present situation and presents 22 chapters by international experts in the field of electricity generation, transmission and distribution, efficiency and tariff setting.

The book is divided into three sections, covering the implications of change; issues pertaining to competition, innovation, regulation and pricing, and the need for new business models in the light of changing technologies.

Significant technological change, mostly on the customer end of the supply chain, have begun to become noticeable. Smart meters enable consumers to manage and control their usage better, and self-generation makes it possible for them to meet some of their own needs. In a relatively short period of time, distributed energy resources transformed consumers into —prosumers”: active participants in the market, rather than passive consumers of bulk electricity from the grid. Suddenly, a growing number of prosumers can generate some or virtually all their electricity needs, at prices on par or, in some cases, cheaper than buying it from the grid.

The articles contained within this book are relevant to the South African situation which, as a result of the state-run electricity generating company's inability to meet the country's electricity demand, faces serious electricity shortages and power interruptions.

Speculation about the falling costs of storage, microgrids and other technologies adds fuel to the current interest in utilities of the future. Among the main issues covered in this book is a discussion of a rational way to address these changes and find a constructive path forward. ■

Special 30% discount offer for *EEnergy Informer* subscribers

Subscribers are entitled to a 30% discount when ordering *Future of Utilities: Utilities of the Future*, with further details provided at the end of this month's newsletter. The link below will take you directly to the publisher's website and a **30% discount code ENG315**, which you can apply at checkout. Please share with others who may be interested in ordering a copy.

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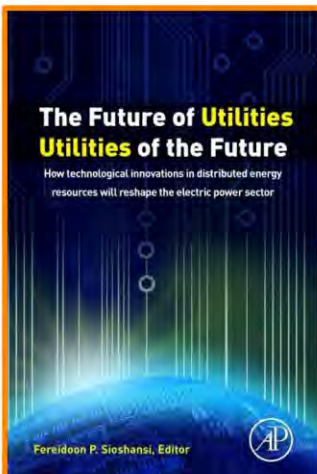
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The Future of Utilities Utilities of the Future

How technological innovations in distributed energy resources will reshape the electric power sector

Fereidoon P. Sioshansi, Editor



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Future of Utilities - Utilities of the Future

How technological innovations in distributed generation will reshape the electric power sector

Edited by: **Fereidoon P. Sioshansi**, President, Menlo Energy Economics, San Francisco, CA, USA



Rapid technological advancements plus falling costs of **distributed energy resources** (DERs) – which includes **energy efficiency** improvements plus **distributed generation** – is turning an increasing number of **consumers** into **prosumers**, eroding utility revenues and threatening the historical business model.

Equally important are rapid advances in **energy storage**, **electric vehicles**, **microgrids**, **intelligent home energy management**, **demand aggregation**, and **demand response**, all pointing to a different future with a different role for the incumbents.

Future of utilities: Utilities of the future, which includes contributions from experts with different perspectives from different parts of the globe, examines the implications of these developments on the electric power sector.

"The future of the utilities is not yet given, or written. Even those utilities having avoided the market revolution of the past decades won't be able to avoid the 3 tsunamis of supply, demand and technology that are about to hit them. You – and they – can imitate the ostrich and stay blind a bit longer or... read the book!"

Professor Jean-Michel Glachant, Director Florence School of Regulation, European University Institute

"The electricity service of 2010 would be quite recognizable to a customer from 1910, but this is about to change. This book shows how technological innovation, economic forces and new business models could combine to produce radical changes over the coming decades."

Professor Richard Green, Imperial College Business School

"This book brings together the thinking of some of the smartest minds from around the globe to bear on the quintessential question of this age: what will be the future of the electric utility industry?"

Dr. Ahmad Faruqi, The Brattle Group

"New technologies, consumers, and policies are challenging the organizational and operational paradigm of the utilities prevailing since the formative years of the sector. We need to better understand this transition. This book written by leading practitioners and scholars offers a valuable guide to the issues and options for creating the utilities of future."

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