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In this issue

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Putin: We Will NOT Supply Anything

Whoever can endure more pain longer is likely to prevail

By now it has become abundantly clear that the world order that was established following the **Second World War** and reinforced – we assumed – following the fall of the **Soviet Union** in 1991, has changed with the Russian invasion of **Ukraine** on 24 Feb of this year. The energy trade relationships that were developed over the years, with the assumption that Russia would stick to the unspoken rules, have been utterly and irrevocably shattered. Few countries in Europe could go back to, for example, depending on Russian oil, natural gas, coal, grain, fertilizer or virtually any other commodity if they can find a substitute supplier somewhere else. And as the war drags on and both sides become more defiant and adversarial, the relationships have gone beyond the point where they can be reconciled.

We will not supply anything but death, misery and high prices

Vladimir Putin, who thought his "**special military operations**" would be over within days with the fall of Kiev, turning Ukraine into a docile puppet regime as in **Belarus**, has suffered major setbacks as he cannot even claim victory in the eastern front. Since he cannot back down and admit defeat, he is compelled to carry on. He must realize that he has lost his clients in the West, and must pivot to towards the East, finding new markets in **China, India** and elsewhere for Russia's vast fossil fuel resources.

Speaking at the **Eastern Economic Forum** in **Vladivostok** in Russia's Far East in early Sept 2022, an angry and combative Putin called **Western sanctions** against this country "stupid" and threatened to halt all energy sales to his enemies if they move forward with a proposal by G7 – the Group of Seven industrialized economic powers – to introduce a **price cap** on Russian energy imports. He said,

> "We will not supply gas, oil, coal, heating oil — we will not supply anything."

Was he bluffing? Perhaps not. By any measure things are not going according to plan, yet Putin made it clear that the West will hurt as much as Russia, if not more, especially during the coming winter months.

His biggest advantage – at least for the time being – is that he need not be concerned about public opinion or face domestic pressure as do democracies of the West. In the longer term, if the EU and the NATO remain united and Ukraine can sustain its counteroffensive, even Putin is vulnerable. And despite the defiant speech, he must know it. That's what makes him even more dangerous and unpredictable. ■

War Of Attrition + Energy War

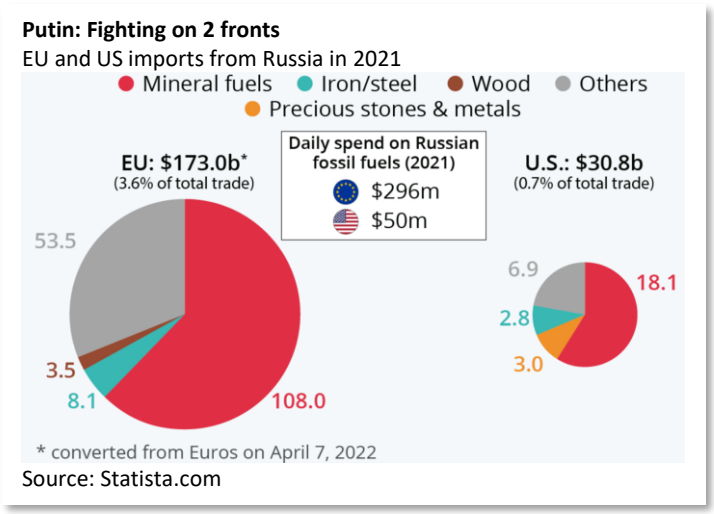
Ukraine and the West are fighting not one but two wars

A quote attributed to the legendary American football coach **Vince Lombardi** says, "The spirit, the will to win, and the will to excel are the things that endure. These qualities are so much more important than the events that occur." Even though Lombardi was referring to the players on the field, the spirit to fight and the will to win goes to the core of who will ultimately prevail in Ukraine as Russian's unprovoked invasion drags on with no end in sight. But while the fighting in the field has turned into a war of attrition, another – and arguably more important – battle is being fought between President **Vladimir Putin** and the West.

As the winter approaches, many analysts, including **Daniel Yergin** of **CERA Week** believe that Putin has opened a second front in Ukraine, an ***energy war***, hoping to "… create economic hardship [that] will lead to social turmoil and populist parties coming to power… (in Europe)" with the ultimate aim "… to fracture the [European] coalition…."

In a 26 Aug 2022 post, Yergin says that Putin "… has already won a political victory in Italy, where **Mario Draghi** left office a month after a visit to Kyiv in a show of solidarity with the Ukrainian people."

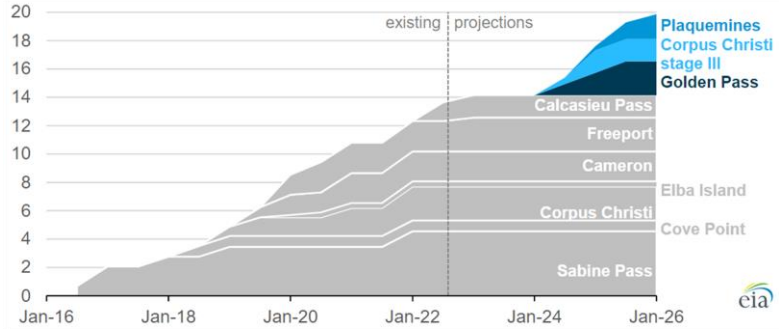
During the summer months, "… while the Europeans were 'desperate' to fill their supply of natural gas before the winter," Putin was "… equally determined to … prevent them from doing so." Russia, which in normal times supplied some 38% of Europe's natural gas needs, higher for some, "… has reduced that supply by 70%." Moreover, the "… decision hasn't hurt Putin economically, yet" because "…what they (Russia) is losing in volume, they make up for in (higher) price."



Neither battle, however, is over yet and Putin could end up losing on one, or possibly both

fronts. On the energy war, Yergin points out that since Feb 2022 Putin "… basically demolished what he spent 22 years building, which was Russia being integrated into and benefiting from being part of the global economy. That's over now."

The US to make up for some of the lost natural gas supplies to EU
The US has more LNG export capacity than any other country averaging 11.1 billion cubic feet per day (Bcf/d) during the first half of 2022



Source: EIA

As far as the Western pressure, it is not clear how long it will last (lead article). Moreover, Yergin notes that, "Only about 35 of the world's 195 or so countries have put Russia in the penalty box," while the rest are willing to hold their nose and look the other way. "…many Asian, Latin American, and African countries are staying out of the debate." **India**'s foreign minister, traditionally a non-aligned country, recently said, "We're not taking sides here. We care about **food, fuel** and **fertilizer**." Russia is the second largest supplier of oil to India, followed by **Iraq** and **Saudi Arabia** – not the most democratic countries.

Similarly, China's **Xi Jinping** has refused to condemn Russia for its invasion. Likewise, a number of counties in Africa have said that what they need is cheap oil, grain and fertilizer – everything else is negotiable. As Yergin puts it, "It's important (for Western leaders) not to delude oneself into thinking the world is united on this (support for Ukraine)." With few exceptions, most politicians are ultimately interested in whatever is *politically expedient*. And that is precisely what Putin is counting on. ■

Macron: End Of Abundance

More politicians have to explain the necessary hardships to their constituents

One cannot be sure where President **Emanuel Macron** went for his Aug holidays, who he spoke with, or what he read, but he came back to Elysée Palace with a somber message when speaking to his cabinet, which unusually, was broadcast live to French citizens. Clearly the message was for public consumption, even if not what most French citizens wanted to hear after an unusually hot summer with droughts, massive wildfires, trouble at nuclear power plants, concerns about rising inflation and the Ukraine crisis which has turned into a war of attrition. Macron chose to deliver a stark speech to anyone who wanted to hear.

He warned that France faced "sacrifices" in a new era marked by climate change and instability caused by Russia's invasion of Ukraine that signaled "the end of abundance".

> "I believe that we are in the process of living through a tipping point or great upheaval. Firstly, because we are living through... the end of what could seem like the end of abundance."

Referring to the war in Ukraine, he added:

> "Our system based on freedom in which we have become used to living, sometimes when we need to defend it, it can entail making sacrifices."

Macron: End of abundance

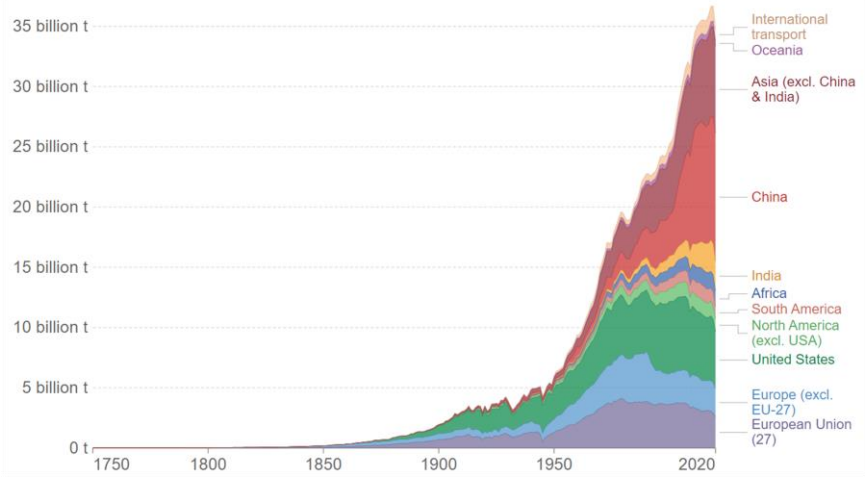
Perhaps Macron knows something we don't know. Perhaps he is preparing France for what could be a difficult winter with rising energy prices and/or supply shortages. He may also be preparing French citizens for the accelerating impacts of climate change including more frequent and severe droughts, more forest fires and higher temperatures in subsequent years.

"This overview that I'm giving – the end of abundance, the end of insouciance, the end of assumptions – it's ultimately a tipping point that we are going through that can lead our citizens to feel a lot of anxiety… Faced with this, we have duties, the first of which is to speak frankly and very clearly without doom-mongering."

What Macron describes, lack of abundance is fundamental to the discipline of economics, namely the study of scarcity and how to allocate the resulting pain and suffering, typically through scarcity pricing. As (or if) energy becomes scarce its price rises to the level necessary to sufficiently reduce demand, hence brining supply and demand in balance. High quality caviar or champagne are expensive, but there are not usually in short supply simply because not very many can afford them. Would the same principle be necessary for energy, water, food, fertilizer and other necessities?

The reverse is true for **carbon emissions** where there is an overabundance (visual). We emit far too much because the price is too low or does not even exist. That explains why there is an oversupply of greenhouse gas emissions in the atmosphere.

Overabundance of what we don't want: Global carbon emissions, 1750-2020



Source: Our World in Data

If the war in Ukraine continues, as seems likely, more politicians will have to explain why historic assumption no longer apply, abundance of essentials such as energy, water and food can no longer be taken for granted and ordinary citizens may have to make personal sacrifices for the good of the country and/or humanity. Mr. Macron has a point.■

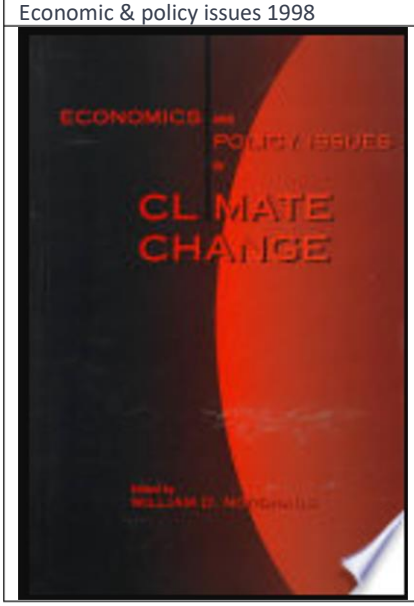
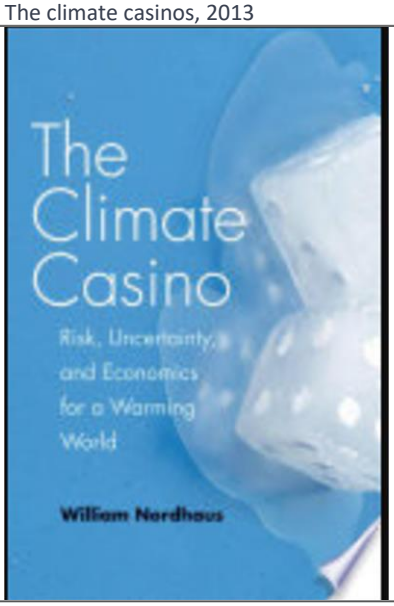
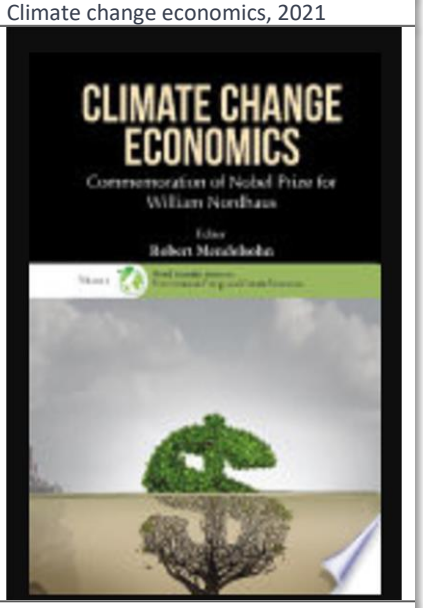
The Carrot, The Stick And The Hockey Stick

Economists underestimated the speed and impact of climate change

Ever since **climate change** was confirmed as a serious issue with significant economic and ecological consequences, most – but not necessarily all – economists agreed on the most elegant and least intrusive solution. Since the main culprit was identified as increasing emissions of **greenhouse gases** (GHGs) mostly from burning of fossil fuels, the obvious answer was to make it more expensive to emit – by introducing an economy-wide, preferably global, **carbon tax**. Such a tax, in time, would encourage firms and consumers to make adjustments in what they do and how they do it as they saw fit without the need for a carbon regulator. The tax would be commensurate with the damage caused by the emissions and could be adjusted over time.

Among the pioneers of this approach was Princeton economist **William Nordhouse** who started his research on the subject, namely the best means of addressing climate change. One of his earliest major publications came out in 1992, followed by many others including several seminal books (below).

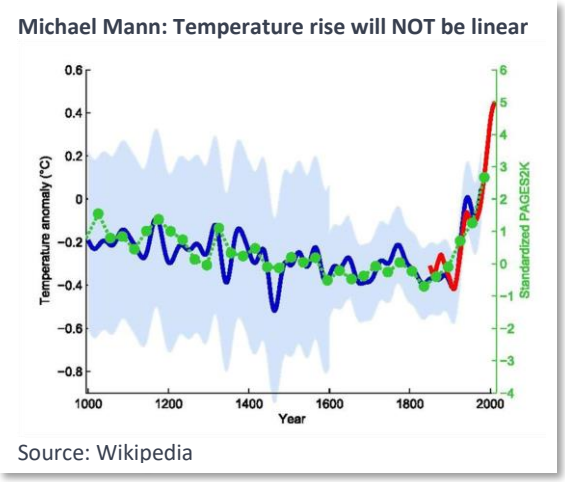
William Nordhouse: The economics of climate change

Economic & policy issues 1998	The climate casinos, 2013	Climate change economics, 2021
		

Nordhouse was awarded the **Nobel Prize** in economics in 2018 partly in recognition of his work, making him more of a celebrity.

While Nordhouse and his cohorts were doing their research **Michael Mann**, a professor at Penn State University and 2 colleagues published a controversial article in 1998 that disputed the predictions of many climate change models, which were, for the most part, extrapolating gradual historical global temperature rise into the future. Mann's **hockey stick chart** suggested that once the earth starts warming up, the temperature rise would be exponential, not linear – as will be its adverse impacts.

Mann's *hockey stick theory* was attacked, disputed and ridiculed by the usual suspects, the anti-climate establishment and their supporters as well as some academics. Many simply did not believe the sharp rise in temperatures predicted by Mann – the extreme right of the chart on page 6.

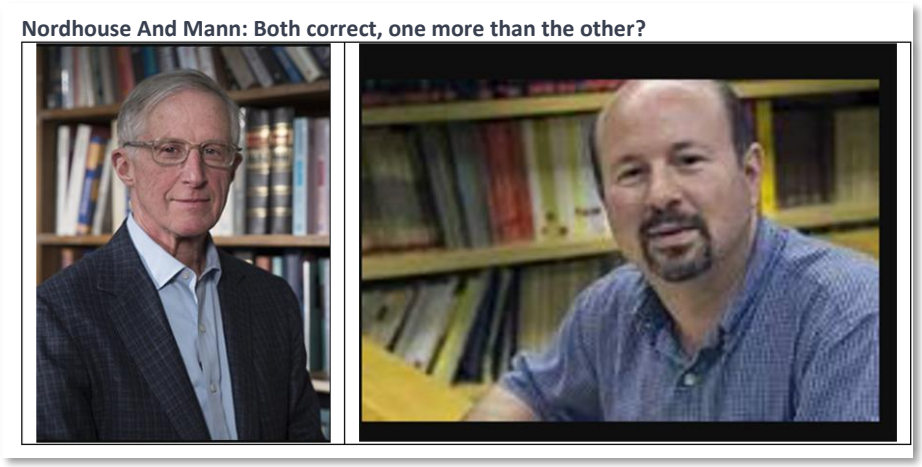


Source: Wikipedia

Fast forward to 2020s – and more frequent extreme weather events with increasingly more devastating impacts including unusual floods, unprecedented heat waves (following article), cold spells, multi-year droughts, forest fires and other calamities. Just as it became impossible to deny that cigarettes are harmful it must be difficult to be a climate denier – yet the diehards manage to find reasons to dispute the mounting evidence.

Looking back, it is clear that the **hockey stick theory** was spot on and suggests that we are in fact heading into uncharted climate territory. As for the **carbon tax**, the idea was never politically popular – certainly not in the US – and the range of numbers suggested by Nordhouse and others for a carbon tax was probably too low to have made much of a difference.

More fundamentally, the idea that you can reduce or discourage a *bad* like carbon emissions by making it more expensive has been replaced by making a *good* more attractive through incentives and subsidies. The proverbial *carrot* has proven to be politically more popular than the *stick*. More homeowners, for example, can be persuaded to install **rooftop solar panels** if the investment is subsidized. Similarly, people buying new cars may be persuaded to buy an **electric vehicle** (EV) given financial incentives. These types of measures may not be efficient nor elegant, but they are politically expedient, as reflected in President **Joe Biden's** recent climate bill. It is heavy on carrots and virtually devoid of sticks.



Other targeted and technology-specific regulations or mandates also appear *tolerable* if not exactly *popular* with politicians and regulators – such as banning the sale of new **internal combustion engines** (ICEs) in the UK or California (article on page 9) or requiring all new buildings to meet stringent **energy efficiency standards** – as in the **zero net energy building code** passed in California in 2020. Rather than penalizing old, inefficient building owners to upgrade, the regulation incentivizes new buildings to meet higher standards by offering subsidies.

Other ways of micro-managing the energy sector are also popular such as **renewable portfolio standards** (RPS), which nudges the electricity generation mix towards cleaner generation sources rather than penalizing polluting coal-fired plants. The impact, one can argue, is virtually the same: gradual phaseout of coal. As it happens, the falling cost of renewables is compelling enough even without the incentives as described in article on page 11 on wind.

In retrospect, had we adopted a reasonable national or universal carbon tax in the 19980s or 90s covering all goods, services and regions, and increasing the tax over time, it could have probably done a lot of good by now. But we did not – could not – do it then and it would not pass the US Congress even now as reflected in what measures are in the Biden's final climate bill passed in Aug 2022.

Moreover, as the record of successive attempts by the **United Nations** at its annual **Conference of the Parties** (COP) illustrates – efforts to reach global consensus on limiting carbon emissions have not produced tangible results to date despite the slow, incremental progress. The on-going war in Ukraine and the prospects of energy shortages and high prices makes it unlikely that a breakthrough can be achieved at the next **COP in Nov 2022 in Sharm el-Sheikh in Egypt**. Many developing countries in Africa and elsewhere have far more pressing problems to deal with – including famine and economic calamities resulting from high energy and food prices – to focus on the climate issues.

We did not believe it would happen so quickly
Devastating floods have submerged large parts of Pakistan

In the meantime, the tangible effects of the hockey stick theory appear in daily news headlines all over the globe (photo). The editor of this newsletter believes that Prof. Mann deserves a Nobel Prize for pointing out in 1998 what has become obvious today and for taking a lot of abuse for speaking out.

As noted in an article by **Lydia DePhillis** in the 26 Aug 202 issue of ***The New York Times***, "Economists underestimated the impact of global warming, and their preferred policy solution floundered in the US." She's spot on. It's time to rethink what works and what does not given the political realities, not economic theory. The carrot may not be efficient or elegant, but it appears to be mightier – and more palatable – than the stick. ■

CAISO Survives The Extreme Heat, Just Barely

This time CAISO was lucky. What about the next time?

The last time **California Independent System Operator** (CAISO) set a peak demand record was during a heat wave in late June 2006. On 6 Sept 2022, an extremely hot day, it shattered this record by 1,200 MW reaching 52,061 MW. The only reason the grid managed to make it through the late afternoon hours was **conservation** requested – mandated may be a better word – by consumers who were warned in blunt terms that if they did not cut back, they would face rotating backouts. The dire and persistent messages – there were too many from multiple sources – came from the Governor, the CAISO, the utilities as well as the news and social media. Your editor received several on multiple days via e-mail, text message, automated telephone calls as well as virtually any news channel one would normally listen or watch.

Conservation efforts saved the day on 6 Sept 2022 during CAISO peak demand

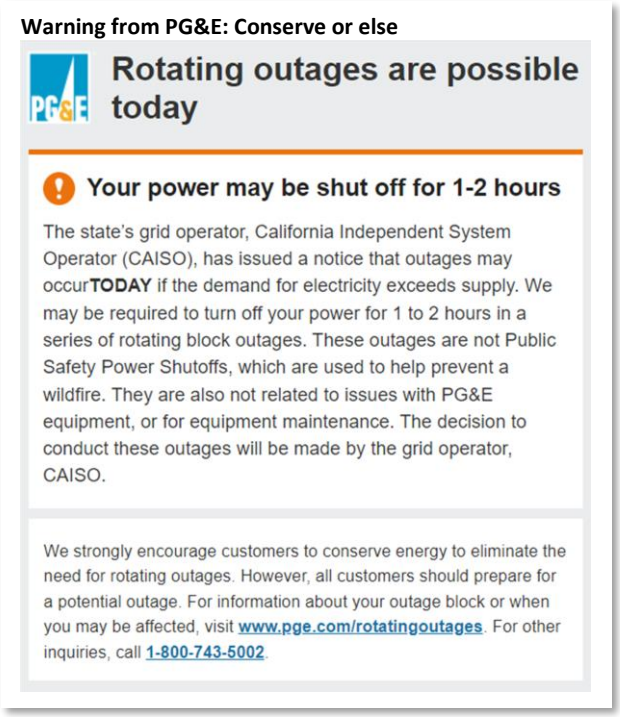
Source: CAISO

At around 5:45 pm, as the demand was outstripping available supplies, the CAISO resorted to a wireless emergency alert system normally used for localized Amber Alerts. The messages went to virtually anyone within a large portion of the state with high temperatures and high penetration of air conditioners. Within half an hour, CAISO noticed a drop of roughly 2,000 MW in demand on its network from roughly 27 million residents. That, more than anything else, saved the day and averted rolling blackouts. The details are still being sorted out. No one can be sure how much of the observed demand reduction came from voluntary conservation vs. other demand response measures.

After surviving the day, **Elliot Mainzer**, the CEO of CAISO credited the wireless emergency alert but added that "Our absolute intent is not to have to do that again tonight (on 7 Sept)," noting, "That is a tool of absolute last resort."

As your editor sees it, the main lessons to be taken from this close call – and the hot, dry season is not over yet – is that California, like the rest of the arid US Southwest is getting progressively hotter and drier. This – on the *supply* side – means less hydro resources when it is most needed and – on the *demand* side – more air conditioning load simply to stay alive in **triple digit** (Fahrenheit) temperatures. Professor **Alan Mann's hockey stick theory** (preceding article) explains some of what is happening. There are undoubtedly many other reasons but the assumption that climate change will happen gradually over decades has proven incorrect. Things are in fact getting much worse and at a much faster pace than many, CAISO included, had previously assumed.

Warning from PG&E: Conserve or else



The second lesson is that it is the **net load** and the dreaded "**duck curve**" phenomenon that CAISO predicted in 2012 that stresses the system and the worst time is during the 4-9 pm period when the sun is beginning to set while the demand remains undiminished. In places such as California, where the solar component is dominant on sunny days, more storage – CAISO currently can rely on around 3 GW – and flexible demand is needed.

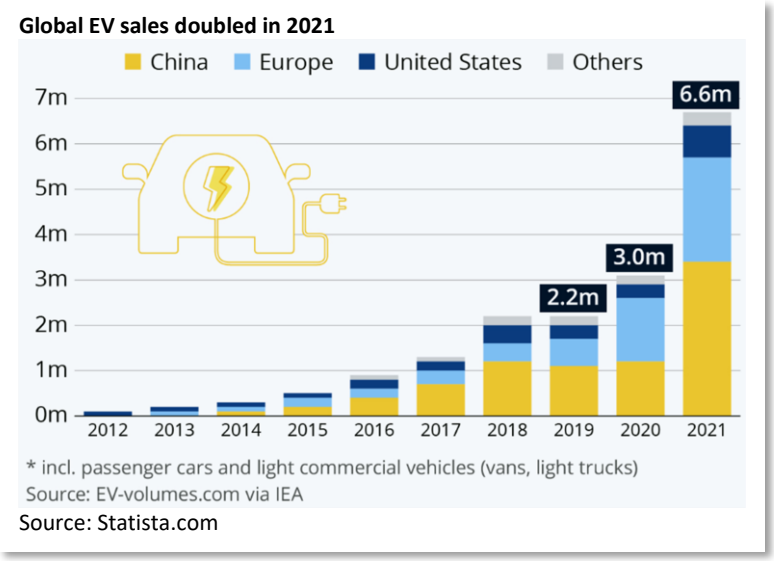
This time, it was a close call. Next time, CAISO may not be so lucky. Customer fatigue sets in after a few very hot days. And if the lights go out even for a few hours it will be a major embarrassment for all involved and a major setback for California's 100% renewable target by 2045. ■

California Bans Sale Of ICEs Starting In 2035

Will California have enough juice to charge the electric vehicles?

While the writing has been on the wall for some time, it was not official until 25 Aug 2022 when the **California Air Resources Board** (CARB) formally approved a total ban of virtually all new **internal combustion engines** (ICEs) in California starting in 2035. It will be remembered as a major milestone in the history of personal transportation since California is the biggest car market in the US – and amongst the biggest in the world. Moreover, the move by California may encourage a number of other states to follow suit – leading to a *de facto* moratorium on the sale of new ICEs as car makers switch to **electric vehicles** (EVs) in droves, reducing their cost while increasing their range.

Lauren Sanchez, Gov. **Gavin Newsom's** climate advisor, called CARB's decision "a huge day not only for California but the entire world," adding that the mission is to "Move the state away from oil." Under the new rules, 35% of new cars must be zero emission by 2026, 68% by 2030, and 100% by 2035. If automakers fall short, they could be fined $20,000 for each ICE sold.



Source: Statista.com

Owners of existing ICEs can continue to drive them after 2035 and it will be legal to buy and sell used ICE cars and light trucks, but not buy a *new* one in California.

Cost is an issue. According to **Kelley Blue Book**, the average EV sold for $66,000 in July 2022, compared with $48,000 for the average ICE vehicle. But CARB believes that the cost differential will diminish over time. Moreover, operational savings in fuel and maintenance can make an EV a better investment over time. Of course, the price of electricity and petrol will matter too. If, for example, most EVs can be charged during sunny hours, the electricity is virtually free.

More serious is the issue of sufficient EV charging infrastructure, especially for apartment dwellers who cannot install a charger in their garage. But again, CARB and other state agencies believe that these obstacles can be resolved by 2035. Only time will tell.

Finally, will California have sufficient resources to meet the increased demand from the EVs? That, to a great extent, depends on when, where and how they are charged. Charging EVs during the 4-9 pm period on hot summer days must absolutely be avoided as explained in the previous article.

How far is California from its 100% target? The state previously maintained a goal of 5 million zero-emission vehicles (ZEVs) by 2030 pursuant to **Executive Order B-48-18**. According to the latest data, market share for ZEVs is around 15.6% of new car sales. By that measure, the Golden State has some ways to go.

California, of course, is not the first or the most ambitious in phasing out polluting petrol powered cars. The UK has also banned their sale as early as 2030 while other markets are following similar schemes. ICEs have had a long run, but their time may be coming to an end, and as they are gradually phased out, the demand for gasoline and diesel will dwindle.

With so much bad news these days, it is nice to have some good news. Getting rid of gas guzzling cars is likely to be another war of attrition. ■

https://centerforjobs.org/ca/zev-reports/states-progress-on-zero-emission-vehicles-zev-goals-q2-2022-results

Big Oil: Not Easy To Be Loved

Oil and gas majors are caught in crossfire

The oil and gas supermajors are caught in the crossfire. Governments want them to produce more to ease the pressure on supplies leading to unprecedented price rises, especially for natural gas, especially in Europe. Policymakers are encouraging more investments – certainly in the near-term – while subsidizing consumers who are facing steeply rising energy bills. At the same time, the environmentalists are alarmed that continued investments in fossil fuels with further delay the eventual transition to a more sustainable future – whatever that means and whenever it comes.

The latest analysis from the **International Energy Agency** (IEA) shows that government support for fossil fuels in 51 countries worldwide almost doubled to $697.2 billion in 2021, from $362.4 billion in 2020, as energy prices rose with the rebound of the global economy. Moreover, the IEA reckons that fossil-fuel *consumption* subsidies will rise even further in 2022 due to higher fuel prices following the Ukraine crisis.

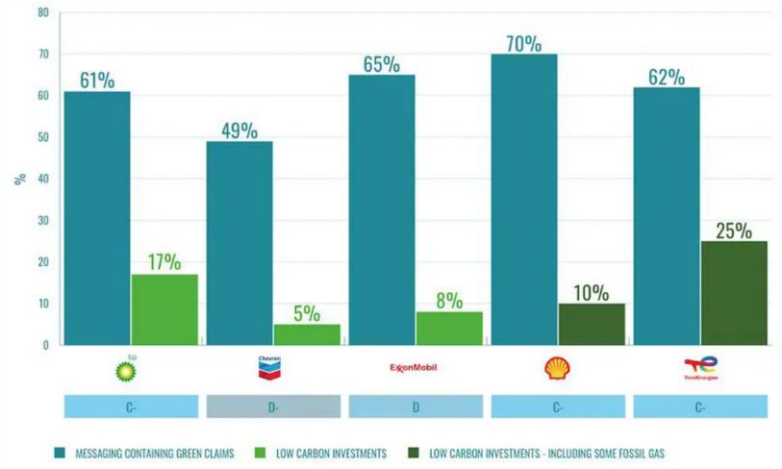
Given these contradictory pressures what are the super majors doing? They are increasingly becoming dishonest by doing one thing while saying another. According to **Faye Holder**, **InfluenceMap**'s program manager, "The world's big oil and gas companies are spending huge amounts of time and money talking up their green credentials, while their business investments and lobbying activities tell a different story."

InfluenceMap says that 60% of public messages coming from **BP, Shell, Chevron, ExxonMobil** and **TotalEnergies** contain "green" claims while the large publicly listed companies are allocating a mere 12% of their capital expenditure budgets on so-called 'low-carbon' investments on average this year, even less on renewables. The group sifted through 3,421 public communication messages from the 5 companies during 2021, including company and CEO social media accounts, press releases, speeches, and secondary websites intended for the public to reach its conclusions.

InfluenceMap however notes that the 3 European super majors – **Shell, BP**, and **TotalEnergies** – focused more on energy transition claims than their US-based competitors. In particular, TotalEnergies wants to be recognized as an integrated energy company, not an oil or gas major. Subtle difference.

The American giant **Exxon** centered most of its public messaging on emission reductions, portray itself as a 'low emission' oil and gas producer while **Chevron** appears less concerned about promoting its climate credentials than the others. It used more pro-oil and gas messages (37%) than any of its competitors – saying more or less what it does, which is to produce more oil and gas.

Big oil: Saying one thing (green), doing another (blue)



Source: InfluenceMap

InfluenceMap gave Shell,TotalEnergies, and BP a 'C-' while Exxon and Chevron got a 'D' and 'D-' respectively. As it stands, none are on track to deliver on the goals of the Paris climate policy to keep global warming to below 2C.

Of course, the listed oil majors are a relatively small part of the overall global carbon emissions from fossil fuels. The national oil companies which include **Saudi Aramco** and others, are even less concerned about the impact of their investments and operations as they collect record revenues thanks to the higher prices following the **Ukraine war**. Ditto for coal companies, who find their even dirtier fuel currently in high demand.■

Wind Getting Better All The Time

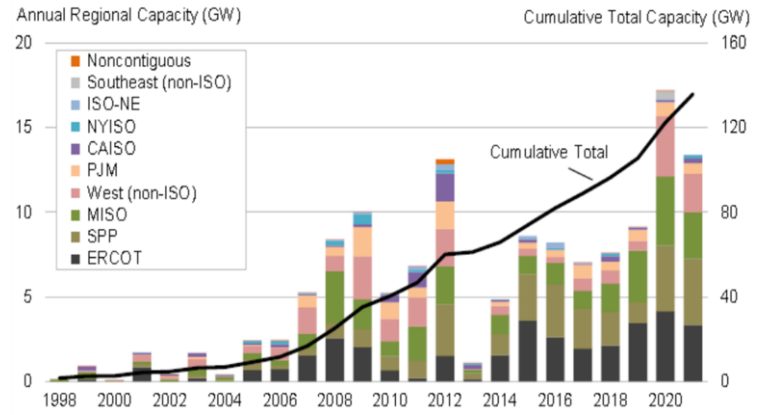
A mature technology continues to improve incrementally

Lawrence Berkeley National Laboratory's annual update on the status of the US wind technology, cost trends and deployment is a perennial good read. The latest version of the report, **Land-based wind market report: 2022 edition**, released in mid Aug 2022 provides an updated overview of data and trends in the US wind energy industry. It says that despite the ongoing supply chain challenges, wind continued strong growth in 2021 with technology improvements and low prices. Last year, however, was not the best compared to 2020 but the long-term trend is upward as shown on the visual on next page.

With the addition of 13.4 GW of new capacity and roughly $20 billion investment, wind comprises a growing share of the US electricity supply. The new additions represented 32% of all newly added generation capacity and accounting for more than 9% of the nation's electricity supply.

Moreover, at least 247 GW of wind are seeking transmission interconnection; 77 GW of this capacity are offshore – an area thus far mostly neglected in the US – with 19 GW as hybrid plants that pair wind with storage or solar PV. The chart on the next page shows the continued growth of wind installations from very low figures in 1998, and its spread across the US.

2021 was not the best year for US wind yet the trend is upward



Source: Land-based wind market report: 2022 edition, LBL, Aug 2022

After **China**, the US has the world's biggest installed wind capacity, roughly 140 GW at the end of 2021 (table). But measured as a percentage of total generation, both countries lack leaders including **Denmark, Ireland, Portugal, Spain** and **Germany** (visual below) – whereas US and China rank 20th and 26th, respectively.

Having too much wind – or solar – in the electricity generation mix, of course, is a mixed blessing. It results in frequent episodes where wind generation exceeds total demand – with prices crashing as the excess supply must be exported, stored or **curtailed**. **Denmark** can usually export the excess to neighboring Germany, who can usually absorb it without too much trouble given its much larger system.

But in parts of the US – notably in the so-called **wind belt** (map on next page) – there is little spare transmission capacity available to export the power to neighboring regions. This results in frequent curtailment of wind generated energy.

The LBL report notes that incidents of wind curtailment are highest in SPP, ERCOT and MISO regions, in the range of 6-18% in recent years – much less elsewhere. The average for the US has risen from roughly 2% in 2016 to nearly 5% by 2021.

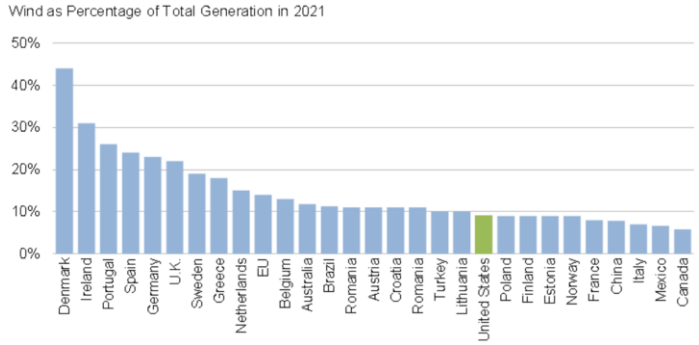
US second only to China in wind

Annual Capacity (2021, GW)		Cumulative Capacity (end of 2021, GW)	
China	47.6	China	338.3
United States	**13.4**	**United States**	**135.9**
Brazil	3.8	Germany	64.5
Vietnam	3.5	India	40.1
United Kingdom	2.6	Spain	28.3
Sweden	2.1	United Kingdom	26.6
Germany	1.9	Brazil	21.6
Australia	1.7	France	19.1
India	1.5	Canada	14.3
Turkey	1.4	Sweden	12.1
Rest of World	14.7	*Rest of World*	138.1
TOTAL	94.3	TOTAL	838.9

Source: Land-based wind market report: 2022 edition, LBL, Aug 2022

Another important development not covered in the latest LBL report is the growing interest in offshore wind – an area not previously explored to any extent. There are several projects already planned in the East coast as well as off the coast of California that could materialize in a few years.

US and China lag others in % of wind serving demand



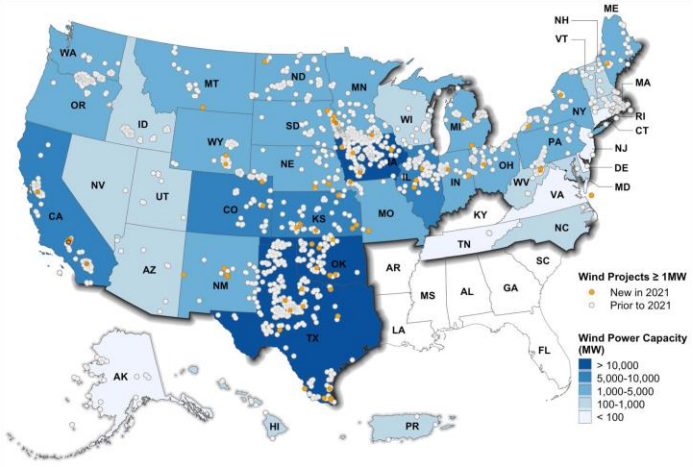
Source: Land-based wind market report: 2022 edition, LBL, Aug 2022

The US is lagging behind Europe and China in offshore wind development, which tends to have less visual impact and generally benefit from more steady wind which are ideally suited for today's larger wind turbines.

The top 5 states in terms of installed capacity and wind as percentage of total generation, respectively, are shown in the table below.

In a handful of states including **Iowa** and **South Dakota**, wind now supplies more than half of the in-state generation averaged over the year. While tax credits help, many of the top wind producing states are not "blue states" nor are they supporting wind for environmental reasons. The simple reason is that they are windy and wind is cheap.

US "wind belt" is windy but not necessarily well connected



Source: Land-based wind market report: 2022 edition, LBL, Aug 2022

While considered a mature technology, performance of wind turbines nevertheless continues to improve with the average **capacity factor** among recently installed projects approaching 40%, considerably higher than earlier periods. The highest capacity factors are typically in the interior 'wind belt' of the country where wind is plentiful and steady.

Improvements in performance are attributed to ever larger turbines mounted on taller towers with longer blades – capturing more wind as they rotate. As recently as 2011 turbines blades 115 meters in diameter or larger were unheard of, but in 2021, 89% of newly installed turbines are that size or larger – a trend that is expected to continue especially with offshore turbines.

Top 5 states in installed capacity (left) and as % of total in-state generation (right)

Installed capacity, GW			Wind as% of total generation	
Texas	36 GW		**Iowa**	55%
Iowa	12		**So. Dakota**	52
Oklahoma	11		**Kansas**	45
Kansas	8		**Oklahoma**	41
Illinois	7		**N. Dakota**	34
US total	136 GW			9%

Recent supply chain disruptions and commodity price increases have resulted in wind energy prices to rise yet according to the LBL report, they generally remain low, around $20/MWh in the interior of the country with somewhat higher prices in the West and East.

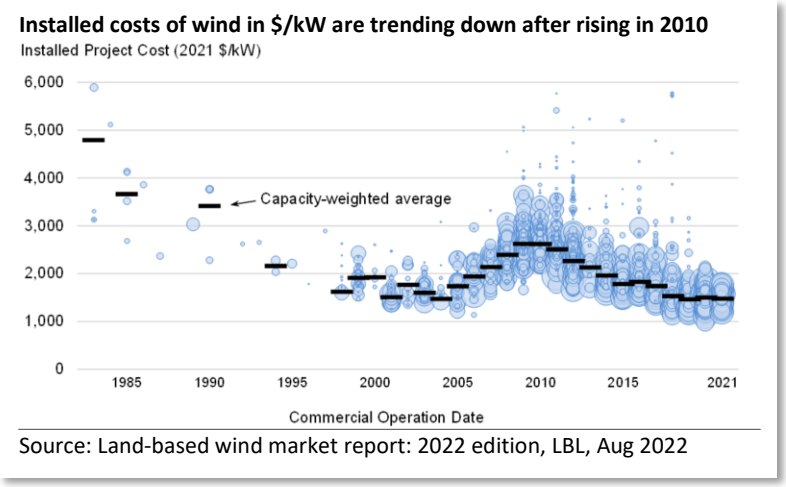
After topping out above $75/MWh for **power purchase agreements** (PPAs) executed in 2009, the national average price of wind PPAs has dropped even as supply-chain pressures have resulted in increased prices in recent years. In the interior '**wind belt'** of the US, recent prices are around $20/MWh. In the West and East, prices tend to average above $30/MWh.

These prices, which are possible in part due to federal tax support, fall below the projected future fuel costs of gas-fired generation – especially with natural gas prices currently high.

Despite the somewhat higher PPA prices, wind remains as an attractive carbon-free option since its costs are generally low compared to wind's *value* in wholesale markets.

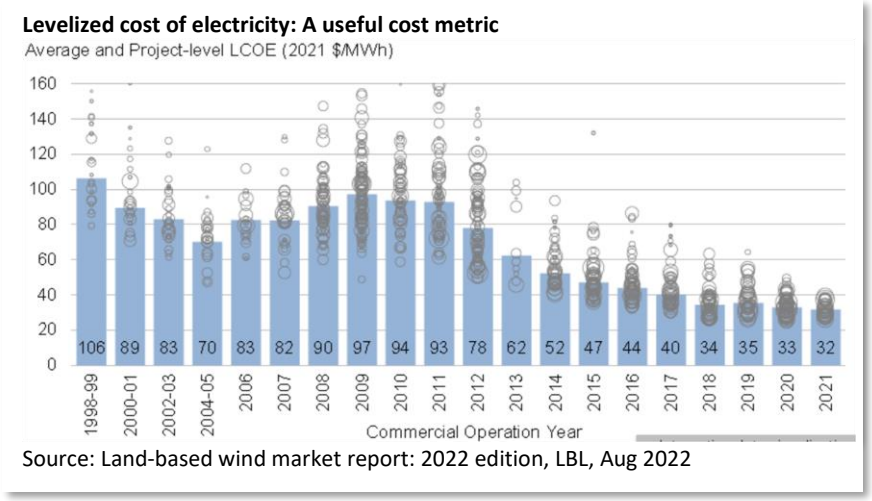
The value of wind in wholesale power markets is determined by the location of wind plants, their hourly output profiles, and how those characteristics correlate with real-time electricity prices and capacity markets in given markets. The market value of wind increased in 2021, averaging

- $16/MWh in MISO;
- $19/MWh in SPP;
- $23/MWh in NYISO;
- $31/MWh in ERCOT;
- $33/MWh in PJM;
- $44/MWh in ISO-NE; and
- $48/MWh in CAISO.



Source: Land-based wind market report: 2022 edition, LBL, Aug 2022

Arguably the most important metric for any generation technology is the average **levelized cost of energy** (LCOE). According to the LBL report, the national LCOE for wind energy was $32/MWh for plants built in 2021, excluding the impacts of federal tax incentives (visual below).



Source: Land-based wind market report: 2022 edition, LBL, Aug 2022

The number varies by time and location and has been relatively stable in recent years. LOCEs were lowest in ERCOT, SPP, and the (non-ISO) West.

According to the LBL data, despite wind's relatively low prices, at the margin it faces tough competition from solar and natural gas (visual on next page).

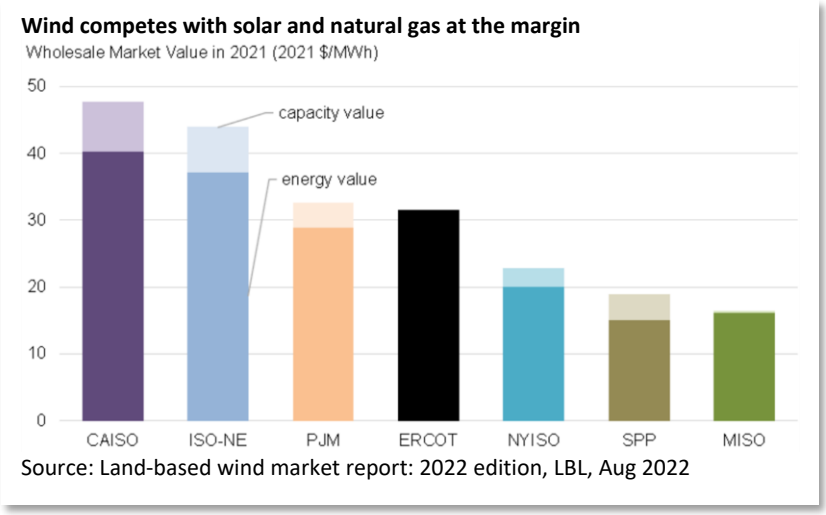
Arguably all 3 are more or less viable – at the end it depends on location, access to transmission, wholesale prices and local conditions.

Both wind and solar are, of course, site-dependent. They are located where the resource is plentiful, land is cheap and suitable and there is access to transmission network. Natural gas has the advantage that it can be located where it is needed and has small footprint, even if its carbon footprint is not. But its price can be volatile depending on the market price for natural gas.

The other consideration is the issue of variability – which comes with most renewables, including hydro resources since the rainfall varies from year to year.

If natural gas prices remain high (following article) and wind and solar prices continue to fall, they will gain market share away from natural gas. But obviously other factors also play a role such as the variability of wind and solar vs. natural gas. Tax incentives and subsidies at both the federal and state level as well as the prevailing **renewable portfolio standards** (RPS) also play at role.

In some markets such as CAISO and ISO-NE, wind's wholesale market value – consisting of energy and capacity component – makes it attractive as illustrated in the visual on right, relative to other markets such as SPP and MISO – which are already rich in wind resources. ■



Source: Land-based wind market report: 2022 edition, LBL, Aug 2022

LBL report at
https://emp.lbl.gov/sites/default/files/2022_land_based_wind_market_report_ppt.pdf

Natural Gas Prices: High And Highly Volatile

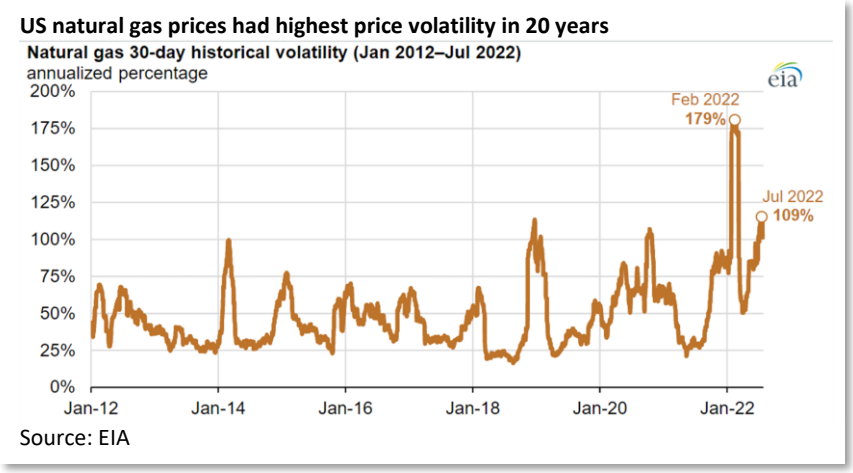
Renewables offer supply security and price stability plus carbon reduction

Some commodities – like gold – have always been scarce and precious, which explains their appeal to conservative investors, especially at uncertain economic times. Other commodities, say coal, coffee or cocoa tend to be plentiful and not expensive, certainly relative to gold. The other important attribute of any commodity whether gold or coffee, however, is its price volatility, which is good for traders but not necessarily for investors or consumers of the commodity. In the energy sector, of course, the three most important commodities are **oil, natural gas** and **coal**. All three have been at record highs while exhibiting significant price volatility since the Russian invasion of Ukraine.

By now, everyone is used to oil price volatility – which sooner or later shows up at the filling station – but natural gas volatility has been less noticeable to most unless you are a major user such as the operator of a natural gas power plant or a major industrial customer.

The accompanying chart shows the natural gas price volatility – a measure of daily price changes – for the US even though it is literally a world away from Ukraine. According to the **Energy Information Administration** (EIA), in the first quarter (January–March) of 2022 it reached its highest volatility level in 20 years, hitting record highs not seen in recent memory.

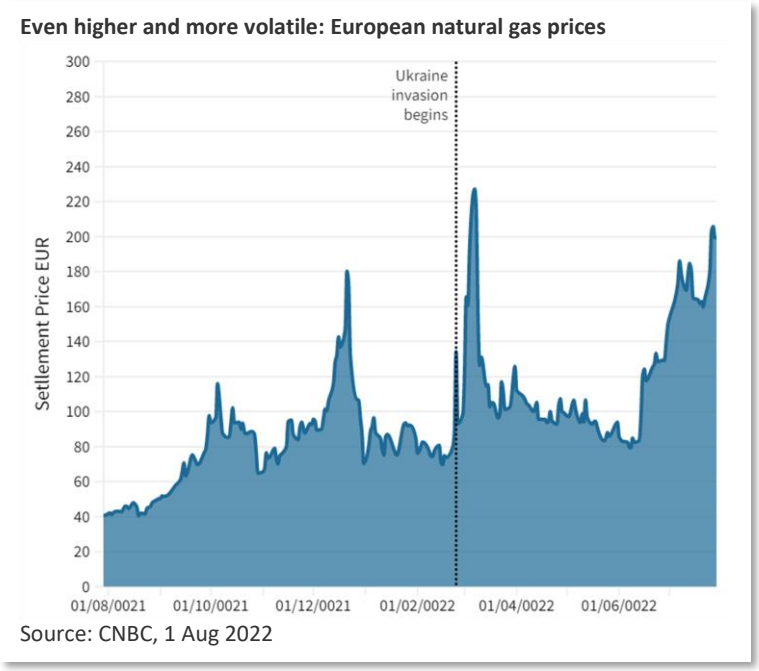
It must be noted that the European natural gas market has experienced far higher prices and significantly higher levels of volatility since the war in Ukraine started in Feb. With the uncertainties about the supply of gas – or lack thereof – from Russia, the prices have risen to levels unseen and hardly imaginable. This explains many current proposals to decouple the high natural gas prices from electricity prices, including generation from renewables, which are not affected – and should not be tied to high price of natural gas. More on this once the European Commission finalizes how it plans to intervene in the market.



The 30-day historical volatility of US natural gas prices, which is based on the benchmark **Henry Hub** front-month futures price, averaged 179% in February compared with 57% during the first quarter of 2021.

Since then, the volatility on a percentage basis has subsided somewhat, in part, because natural gas prices have been relatively higher than during the first quarter of this year.

The Henry Hub front-month futures price averaged $7.19 per million British thermal units (MMBtu) during July compared with an average of $4.46/MMBtu during February. Natural gas price volatility averaged 124% during the first quarter of 2022 and 75% during the second quarter.



Unlike oil, which is mostly shipped in tankers or coal which is mostly shipped on cargo ships, by train or barge, natural gas is mostly shipped via fixed pipelines usually on long-term fixed price contracts. Since the advent of **liquefied natural gas** (LNG) an increasing percentage is transported in specially designed LNG transport ships with gasification and degasification plants on either end of the transport route.

The volume of LNG trade has increased significantly in recent years, especially since the invasion of Ukraine in Feb 2022 as Europeans try to switch from Russian gas to LNG imports from safer sources. **GIIGNL, the International Group of Liquefied Natural Gas Importers** covers the global LNG trade.

Clearly, the Ukraine crisis has impacted the volume, the trade routes, the prices and the price volatility of natural gas. The same would happen to oil with political instability in the Persian Gulf.

Obviously, renewables, as well as nuclear, stand to gain from high natural gas prices and its price volatility. Both offer a level of energy supply security and price stability in a volatile world. Adding the gains from reduced carbon emissions makes them even more valuable as described in the preceding article. ■

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World's Largest Distributed Battery

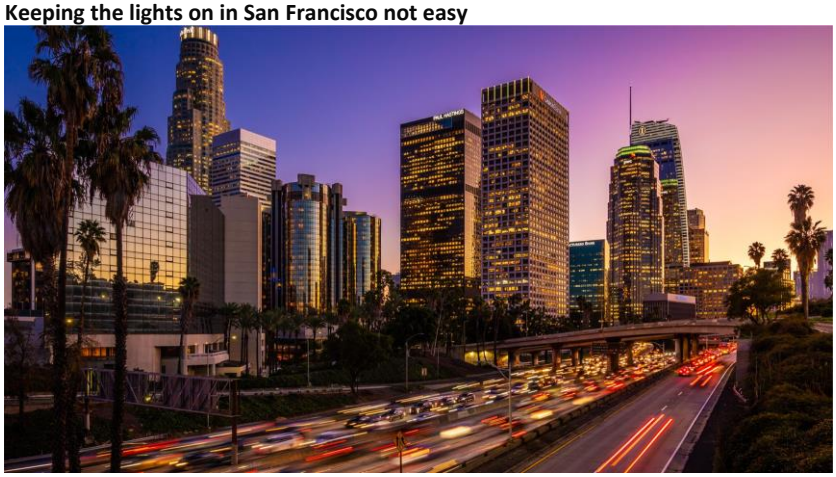
The 16.5 MW of load reduction during a recent hot afternoon was a drop in the bucket

As previously reported in this newsletter, in June 2022, **Tesla** and **Pacific Gas & Electric Company** (PG&E) launched a pilot program to aggregate customer-owned **Tesla Powerwall batteries** and dispatch their excess stored energy to support California's grid during times of emergency in hot summer months. There are an estimated 50,000 Tesla Powerwalls – and quite a few other types of distributed storage systems – in PG&E's vast service area covering nearly the upper half of the state of California. Customers who agreed to participate in the program were promised $2/kWh for exporting electricity to the system when the **California Independent System Operator** (CAISO) is stressed. When the program was launched in June nobody was sure how many Powerwall owners would participate or how often CAISO would need their services.

As it turned out some 2,500 PG&E customers with Tesla Powerwall battery systems signed up and collectively contributed 16.5 MW of – mostly stored solar power – to CAISO on an unusually hot afternoon on 17 of August. It was the first real test of the scheme, and apparently it worked like a charm, as planned, as reported by ***Utility Dive*** in a 23 Aug post.

For PG&E, who has largely had nothing good to say lately, the successful implementation of the scheme was welcomed news. In a Tweet, PG&E Corp. CEO **Patti Poppe** said, "the world's largest distributed battery sure did put on a show!"

Keeping the lights on in San Francisco not easy



The 4-9 pm corresponds to the challenging ramping period during which CAISO loses all its solar supply – as the sun sets – while the demand peaks – as customers continue to use air condition as well as normal dinner time consumption at the end of the working day.

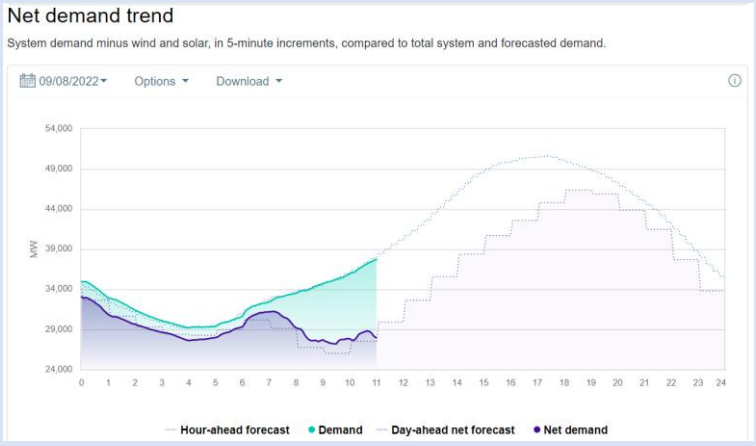
As noted in the article on page 7, the demand on CAISO network recently peaked about 52 GW during the week of 5 Sept hence the 16.5 MW of supply from the scheme is not even a drop in the bucket.

But that is not the point. If, for example, half of the 50,000 Powerwall owners were persuaded to join the scheme over the next few summers, the aggregated impact could be 165 MW. If all homeowners and businesses with batteries – not just Powerwalls – were included, the number could get even bigger, making an impact on CAISO load. And clearly, that is what is required, to have multiple GWs of spare capacity from storage and/or demand response programs to assist CAISO during emergencies.

To encourage such developments, in Dec 2021 California regulators approved a number of provisions to avoid a repeat of the rolling blackouts experienced in the state during an extensive heatwave in Aug 2020 – and the near miss in early Sept 2022. The decisions included ordering the state's utilities to procure

between 2 to 3 GW of demand- and supply-side resources, as well as increase the compensation given to customers to conserve energy as part of California's **demand response** (DR) programs.

California's dreaded "duck curve"



Source: CAISO

Another promising target for reducing load, or increasing supplies, on hot summer afternoons is to entice **electric vehicle** (EV) owners with their much larger batteries to discharge some of the excess stored energy back to the grid when needed. This practice, known as **vehicle-to-grid** (V2G) is not a new idea but has not been applied to scale to date. And there are many reasons for that, among which is that many EV manufacturers don't want the EV batteries to be used for anything other than driving the cars as excessive cycles of charging and discharging could affect the life of the batteries.

But the potential to discharge the vast amount of stored energy in millions of EVs is simply too great to be ignored. California alone already has over 1.3 million EVs, a number expected to rise to 7.5 million within a decade if not earlier. That is a lot of stored energy, far more than in all the Powerwalls in the state.

The good news is that successful experiments continue to show that V2G is practical and offers significant benefits. As reported in the 24 Aug 2022 issue of ***Energy Spectrum***, **Octopus Energy** and **National Grid ESO** (NGESO) in the UK reported that they have successfully demonstrated the viability of **vehicle-to-grid (V2G) technology**.

Based on the success of a series of earlier tests, where Octopus Energy charged and discharged the batteries of up to 20 EVs from participating customers at times of grid imbalance, the two parties estimate that 1 million EVs exporting to the grid for an hour could generate the same amount of power as 5,500 onshore wind turbines.

Moreover, Octopus Energy says that V2G schemes offer potential cost savings for participants as well as non-participants who stand to benefit through grid balancing cost reductions. It is a clear win-win-win application – the grid, the participants and non-participants all gain and nobody is made worse off.■

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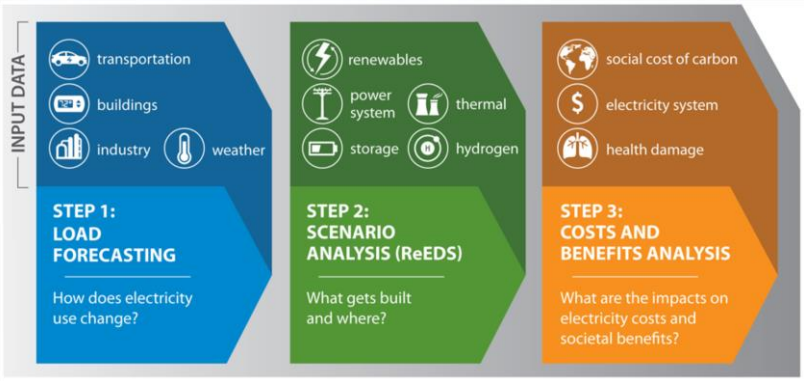
NREL: Transition To Net Zero Feasible *And* Saves Money

But when will it happen?

The skeptics come in all forms and sizes. Some do not believe that climate change is happening or if it is, see no reason to do anything about it. Others say perhaps it is real and happening but not much can be done about it. Transition to a more sustainable energy system is impossible, futile, unnecessary and/or so horrendously expensive as to be impossible. Over the last 2 decades,

multiple studies from reputable sources have argued that in fact such a transition is not only necessary and feasible, but it is in fact not horrendously expensive. Or, more surprisingly, it can actually save money.

NREL: What it takes to transition to net zero



Source: Denholm et al, 2022. *Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035*, National Renewable Energy Laboratory. NREL/TP- 6A40-81644. https://www.nrel.gov/docs/fy22osti/81644.pdf

Among the latest is a new study from the **National Renewable Energy Laboratory** (NREL) which suggests that the US can indeed decarbonize its electric sector in just 13 years, and it could save as much as $1.2 trillion in avoided health and climate costs.

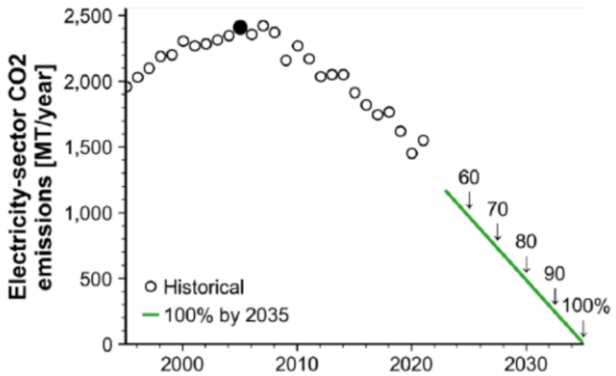
The NREL study considers a range of scenarios to reach net zero emissions by 2035. Three of the 4 scenarios require additional costs of between $330- 400 billion, while a fourth, where the options are limited by transmission constraints and amount of wind that can be deployed, requires more storage and other types of generation doubling the cost to around $740 billion.

But in all cases, there are considerably more benefits in avoided health impacts including avoiding 130,000 premature deaths, saving up to $400 billion plus further saving of more than $1.2 trillion when factoring in the avoided cost of damage from the impacts of climate change. According to **Patrick Brown**, a co-author of the study, "Decarbonizing the power system is a necessary step if the worst effects of climate change are to be avoided."

> "The benefits of a zero-carbon grid outweigh the costs in each of the more than 100 scenarios modeled in this study, and accelerated cost declines for renewable and clean energy technologies could lead to even larger benefits."

As with all such studies, the costs multiply once we reach 90% decarbonization target – finding solutions to the last 10% to net zero is where the problem gets really challenging. The simple reason is the seasonal mismatch between variable renewables – especially wind and solar – and demand.

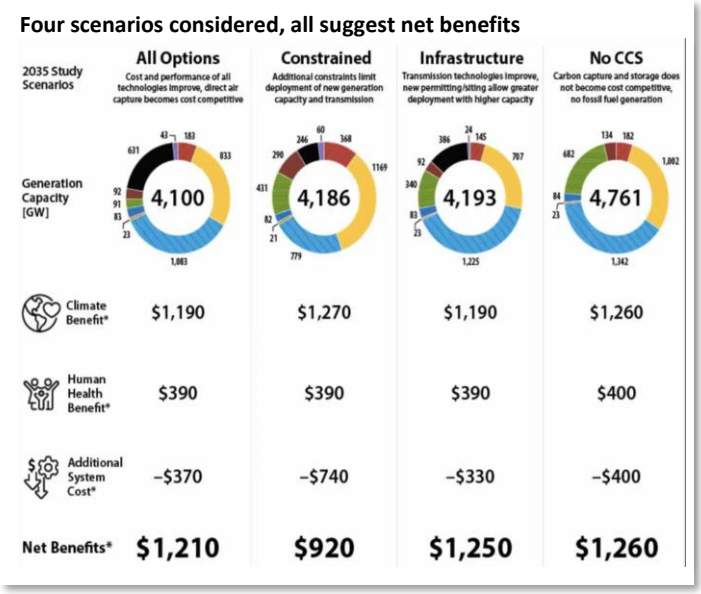
Carbon emissions fall as the share of renewables rise



Source: *Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035*, NREL 2022

Not surprisingly, NREL's solutions include the usual suspects such as **green hydrogen, advanced nuclear, price-responsive demand, carbon capture and storage, direct air capture**, and **advanced grid controls**, options that require further R&D, experimentation and scaling. As noted by **Paul Denholm**, the principal investigator and lead author of the study, "There is no one single solution to transitioning the power sector to renewable and clean energy technologies."

"There are several key challenges that we still need to understand and will need to be addressed over the next decade to enable the speed and scale of deployment necessary to achieve the 2035 goal."

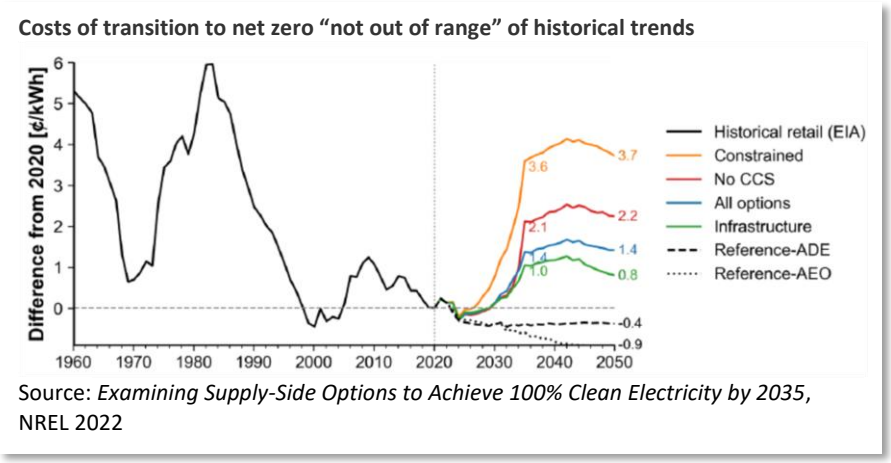


The NREL study's other conclusion – no surprise – is that clean energy technologies must be deployed at an unprecedented scale and speed to achieve a net zero grid by 2035. For example, it says that wind and solar must provide some 60-80% of generation in the least-cost electricity mix in 2035, which will require a combined 2 terawatts of wind and solar, i.e., an additional 70-150 GW a year of wind and 40-90 GW a year of solar capacity, roughly 4 times the current annual deployment levels for each technology.

In each of the four scenarios, around 5-8 GW of new hydro and 3-5GW of new geothermal capacity are deployed by 2035. The biggest need, however, is for long-term or diurnal" storage, roughly 120–350 GW. Non-trivial numbers.

As the systems approaches mostly wind and solar – say around 80-95% of generation – the need for multiday-to-seasonal storage increases to handle the mismatch between variable renewable supply and demand. The seasonal and/or long-duration storage capacity in 2035 ranges from about 100 to 680 GW.

Another co-author, **Brian Sergi**, said, "To get … to 100%, there are many potentially important technologies that have not yet been deployed at scale, so there is uncertainty about the final mix of technologies that can fully decarbonize the power system."



Source: *Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035*, NREL 2022

"The technology mix that is ultimately achieved will depend on advances in R&D in further improving cost and performance as well as the pace and scale of investment."

As the following article explains, the US is projected to reach 24% renewable generation by 2024 more or less following a *business as usual* path. To get to 100% renewable by 2035 will require something dramatically different than business as usual.■

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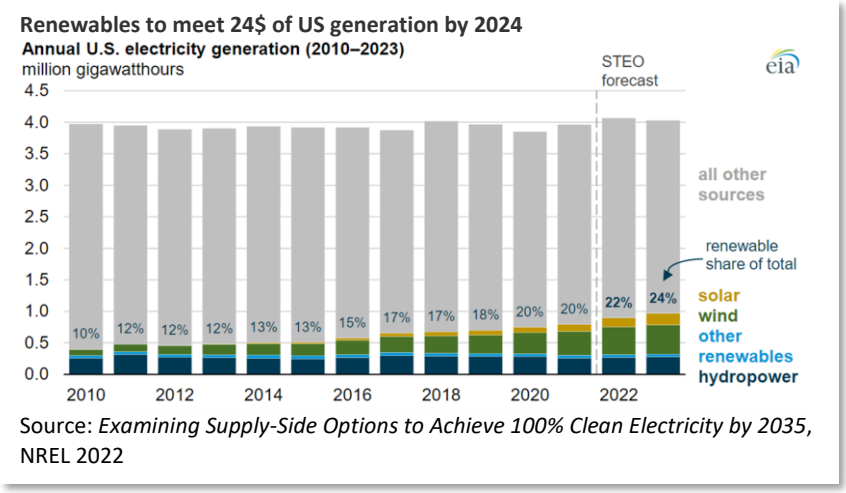
Renewables To Supply 24% Of US Generation by 2024

Despite the prolonged drought, renewables' share keeps on rising

The progress may be slow but steady. The **Energy Information Administration** (EIA) says that the US renewable sources including hydropower, wind, solar, biomass, and geothermal accounted for 20% of electricity generation in 2020 and 2021 with the expectation that the share will increase to 22% in 2022 and 24% in 2024. The reasons are simple: More wind and solar are being added over time while other generation sources, such as coal and nuclear, are retired.

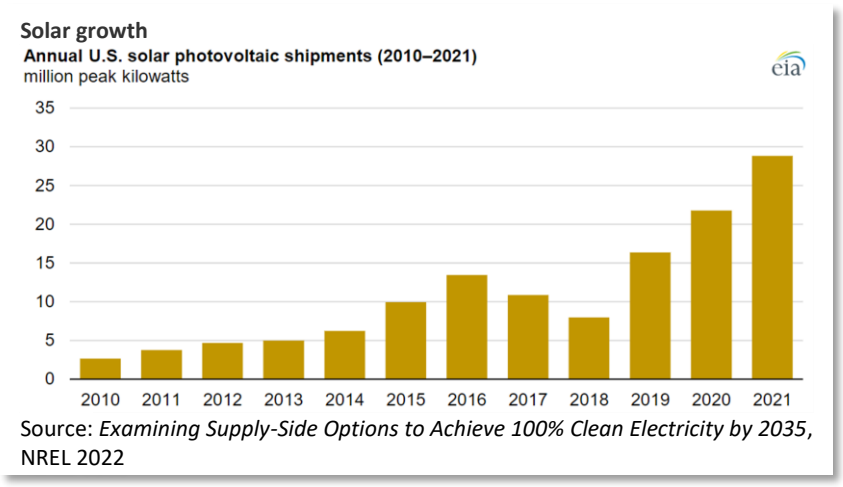


Source: *Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035*, NREL 2022

The two regions with the largest shares of renewable electricity generation during 2021 were the **Northwest**, where renewables accounted for half of the region's electricity generation, and **California**, where renewables accounted for 44%. Both of these regions' hydropower resources, however, were constrained by severe droughts in 2021.

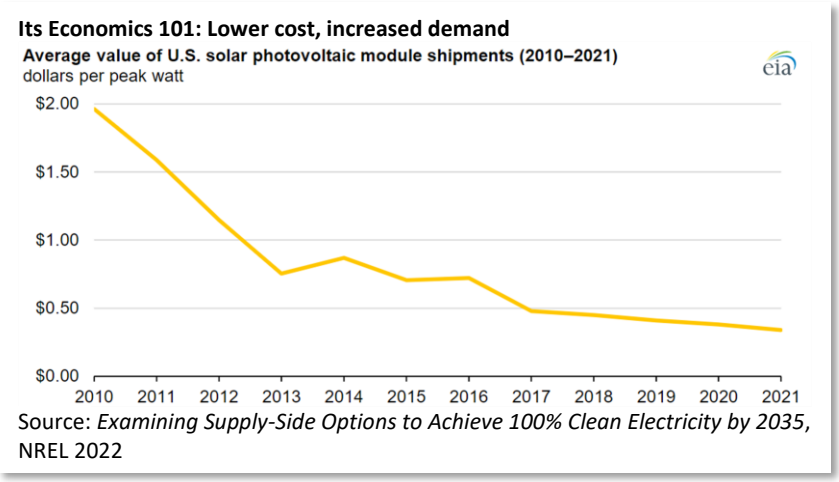
The **Southwest Power Pool** (SPP) region has had the most growth in the renewable share of electricity generation over the past decade, largely due to wind generation. In 2013, 13% of the region's electricity generation came from renewables. That share increased to 40% in 2021, and the EIA expects it to rise to 44% in 2022.

The **Electric Reliability Council of Texas** (ERCOT) has also increased its renewable share from 10% in 2013 to 32% in 2022. ERCOT is the only electricity market where the renewable electricity share has transitioned from less than the U.S. average to more than the U.S. average from 2013 to present. Both SPP and ERCOT have added substantial wind capacity. Earlier this year, output from wind in SPP and ERCOT made it the second biggest source of generation on a single day, 29 Mar 2022.



Source: *Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035*, NREL 2022

According to the **Energy Information Administration** (EIA) shipments of solar photovoltaic (PV) panels rose to the equivalent electricity-generating capacity of 28.8 million kW in 2021, from 21.8 million kW in 2020. The figure includes all shipments including imports and domestically produced. About 80% of US solar panel modules were imports, primarily from Asia.



Source: *Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035*, NREL 2022

The US added 13.2 GW of utility-scale solar capacity in 2021, 25% more than the 10.6 GW in 2020, plus 5.4 GW of small-scale variety in 2021, up 23% from 2020. Most of the small-scale solar installations, some 3.9 GW, were on homes.

The simplest explanation is that the falling cost of solar panels, which have declined significantly since 2010 from $1.96/kW to $0.34 in 2021 despite recent supply chain constraints and higher material costs. The top 5 solar states accounting for 46% of installations were:

- California 5.09 million kW;
- Texas 4.31 million kW;
- Florida 1.80 million kW;
- Georgia 1.15 million kW; and
- Illinois 1.12 million kW.

The longer term outlook for more renewables is improving under **President Biden**, who unlike his predecessor is steering the US towards a lower carbon future. ■

Just Published

Energy Communities:
Customer-centered, market-driven, welfare-enhancing?

Edited by Sabine Löbbe, Fereidoon Sioshansi & David Robinson
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Paperback, 514 pages
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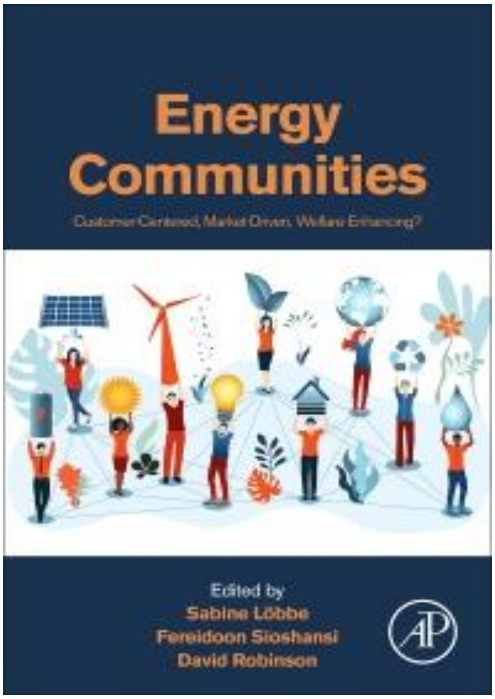
Summary description
In the power sector, distributed as well as renewable energy sources are gaining market share. Simultaneously, the role of the end customer is changing from passive "load" to be served to one of an active participant in the market. By producing, storing and managing energy on their premises, citizens can start to assume responsibility for balancing the energy system. Energy communities may be an important means to support this process. This book explores whether and how energy communities can be part of the solution, serving to integrate customers as active participants in future electricity markets.

The book

- Explores whether and how different kinds of energy communities contribute to the transition towards distributed energy systems;
- Describes how policy, market and regulatory frameworks need to be adjusted;
- Describes the appeal of energy communities to energy customers and identifies their economic, ecological, emotional and social benefits;
- Examines enabling technologies and community design in the power or heating market or involving sector coupling; and
- Explores how energy communities can turn into promising business models for different actors along the value chain.



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New Handbook On Electricity Markets

A must read for anyone interested in electricity markets

For anyone interested in the latest developments and trends in the global electricity markets the recently published **Handbook on Electricity Markets** is a must read. The edited volume, consisting of 22 chapters and 672 pages, is written by leading international experts and offers the most detailed and comprehensive account of global electricity markets ever published. This newsletter's editor is included with a chapter on the latest technological developments on the demand side.

The handbook, edited by **Jean-Michel Glachant**, Director, Florence School of Regulation, Italy, **Paul Joskow**, Economics Professor at the Massachusetts Institute of Technology, US and **Michael Pollitt**, Economics Professor at Judge Business School, University of Cambridge, UK, covers virtually all aspects and markets including the US, the EU, Australia as well as the latest developments in Africa, China and elsewhere. It includes an examination of both supply as well as demand, wholesale and retail markets, decarbonization, the rise of renewable electricity sources; the electrification of mobility, heating and cooling; and recent innovations such as distributed generation, electrical energy storage, demand response and digital platforms that are disrupting the industry.

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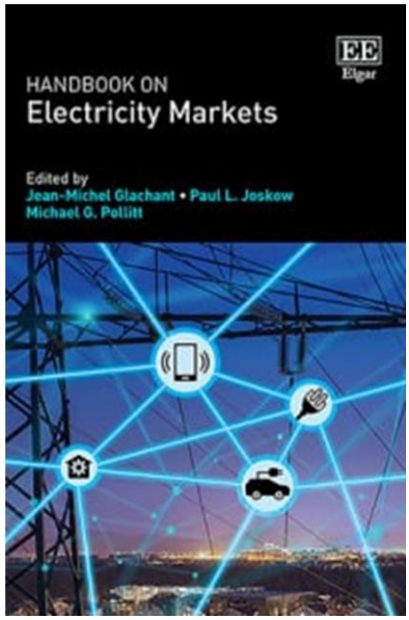

It examines the benefits and the limits of competitive markets while looking at specific markets such as the UK, PJM Interconnection, Texas, Australia, Scandinavia, continental Europe and China including their design features. The book also considers new emerging business models, as well as the impact of electricity sector policy priorities such as universal access and decarbonization.

As the book's title implies, it is a useful handbook to adorn the bookshelves of students, scholars, researchers, professionals as well as regulators, investors and decision-makers engaged in the electricity sector.

Your editor's chapter (#13) is focused on New Technologies on the Demand Side.

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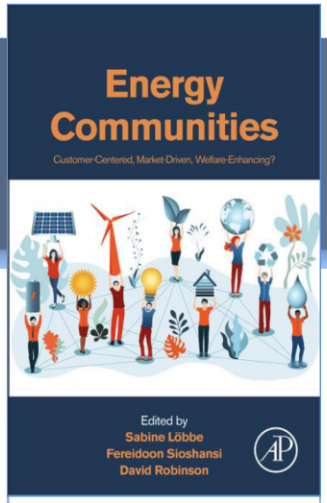

Energy Communities

Customer-centered, market-driven, welfare-enhancing?

Edited by Sabine Löbbe, Fereidoon Sioshansi & David Robinson

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Technology providers in BTM services, building energy management, P2P trading; regulators, policy makers, researchers, power system professionals in generation and distribution, academics

SHELVING CLASSIFICATIONS: Energy Policy, Business and Economics

BISAC CODES: KNB, RND

THEMA CLASSIFICATION: THEMAKNB; THEMARND

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DESCRIPTION

Energy Communities explores core potential systemic benefits and costs in engaging consumers into communities, particularly relating to energy transition. The book evaluates the conditions under which energy communities might be regarded as customer-centered, market-driven and welfare-enhancing. The book also reviews the issue of prevalence and sustainability of energy communities and whether these features are likely to change as opportunities for distributed energy grow. Sections cover the identification of welfare considerations for citizens and for society on a local and national level, and from social, economic, and ecological perspectives, while also considering different community designs and evolving business models.

WHAT AND WHY OF ENERGY COMMUNITIES

In the power sector, distributed as well as renewable energy sources are gaining market share. Simultaneously, the role of the end customer is changing from passive "load" to be served to one of an active participant in the market. By producing, storing, and managing energy on their premises, citizens can start to assume responsibility for balancing the energy system. Energy communities may be an important means to support this process. This book explores whether and how energy communities can be part of the solution, serving to integrate customers as active participants in future electricity markets.

KEY FEATURES

- Explores whether and how different kinds of energy communities contribute to the transition towards distributed energy systems;
- Describes how policy, market and regulatory frameworks need to be adjusted;
- Describes the appeal of energy communities to energy customers and identifies their economic, ecological, emotional, and social benefits;
- Examines enabling technologies and community design in the power or heating market or involving sector coupling; and
- Explores how energy communities can turn into promising business models for different actors along the value chain.

"How do public policies and regulation consider the case of energy communities, their various forms, and the different services that they deliver? Are communities a new type of player in the energy sector, or another supplier, or a collective consumer, or a kind of integrated utility? Are consumers themselves the genuine nature of communities, or only the ones served by those? How should network monopolies, and their regulated metering and settlement processes treat and bill the communities and their members? The chapters of this book address many of these questions and more."

Jean-Michel Glachant
Director of Florence School of Regulation, Florence, Italy

"This book contains a compendium of fascinating responses to the question of whether 'energy communities' are citizen-centered, market-driven and welfare-enhancing Flexible demand has to assume a more prominent role in balancing supply and demand."

Bruce Mountain
Director, Energy Policy Center, Univ. of Victoria, Melbourne, Australia

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Table of Contents