EEnergy Informer

The International Energy Newsletter

December 2022

In this issue

EEnergy Informer
December 2022
Vol. 32, No 12

ISSN: 1084-0419
http://www.eenergyinformer.com

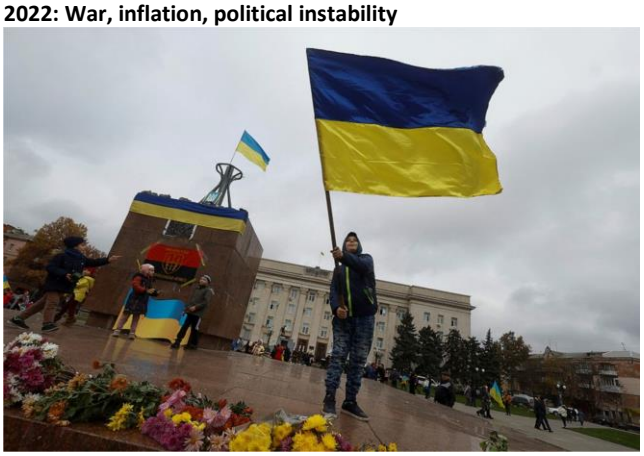
Subscription options/prices on last page

Permacrisis: The Year That Was 2022

Despite the doom and gloom there are hopeful signs

Every year, **Collins Dictionary** selects a **word of the year**. This year's choice was **Permacrisis,** a word describing the feeling of living through a period of **war, inflation**, and **political instability**. **Alex Beecroft**, head of Collins Learning said the chosen word "sums up just how truly awful 2022 has been for so many people." Previous Collins' words of the year include *lockdown*, climate strike, single-use, *fake news*, *Brexit*, *binge-watch*, photobomb and *geek* – many have become household words commonly used. Collins, of course, is not alone. The theme of **CERAWeek**, a major international energy conference to be held in Houston, Texas in March 2023 is **Navigating a World in Upheaval: Energy, Climate and Security"** – or make that *insecurity*. The latest **World Energy Outlook** (article on page 6), the **International Energy Agency's** (IEA) flagship report says the world is experiencing its first **global energy crisis** – a *shock of unprecedented breadth and complexity*.

2022: War, inflation, political instability



The **war** refers to the Russian invasion of **Ukraine** in Feb 2022 – but that, of course, is not the only war. For **inflation** all you need

to do is to visit your local grocery store or check your latest energy bill nearly anywhere in the world. As for **political instability**, there are daily reminders in **America, the UK, Italy, Brazil, Iran, Chile, Pakistan, Argentina, Ethiopia, Somalia** – you name it. As politics in more countries become polarized, elections are increasingly contested and/or do not produce stable governments. If there is no strong mandate for the elected officials, there is no political stability. As if war, inflation, and political instability were not enough, there is famine and **climate disaster** – the topic of the following article.

Yet despite all the doom and gloom there are hopeful signs. The war in **Ukraine** is forcing European countries to reduce their dependence on Russian fossil fuels while increasing the share of domestic renewables, or in the case of **France**, nuclear energy. A crisis may be necessary to get the politicians to act decisively.

In the words of the **Confucius**, "Everything has beauty, but not everyone sees it." While covering the doom and gloom, this last issue of the newsletter for 2022 looks for the proverbial *silver lining in the cloud*. Good news is not easy to find, but there are hopeful signs. ■

COP27: To Party Or Not To Party?

As it stands, COPs are not delivering results fast enough

The **United Nation's 27th Conference of the Parties,** or COP27, was held in **Sharm-El Sheikh in Egypt** 6-18 Nov 2022 with the usual pomp and ceremony, grand speeches by world leaders and dignitaries who warned about the consequences of delay and inaction, urging their fellow leaders to join the fight against climate change. Once the big shots left on their gas guzzling jets, the bureaucrats engaged in the tough task of negotiating, trying to salvage something from what has been an annual shindig of grand promises mostly unkept and under-delivered. This year's event was even more challenging than those of the past because the war in **Ukraine,** surviving the winter's cold, fighting inflation and citizens' discontents – for some, famine, and political instability – has distracted attention away from climate.

No doubt, Putin's brutal invasion was the proverbial rain on COP27's party. That aside, many environmental activists have lost patience with the UN-sponsored approach to addressing the climate crisis, seeing it as too little, too late. The process is slow, bureaucratic, and protracted – after all this is the 27th time the summit is taking place with, as many see it, too little progress. Expressing her disappointment at the process the Swedish climate activist **Greta Thunberg** skipped it, characterizing the summit as a forum for ***greenwashing***. She said, "I'm not going to COP27 for many reasons, but the space for civil society this year is extremely limited," adding,

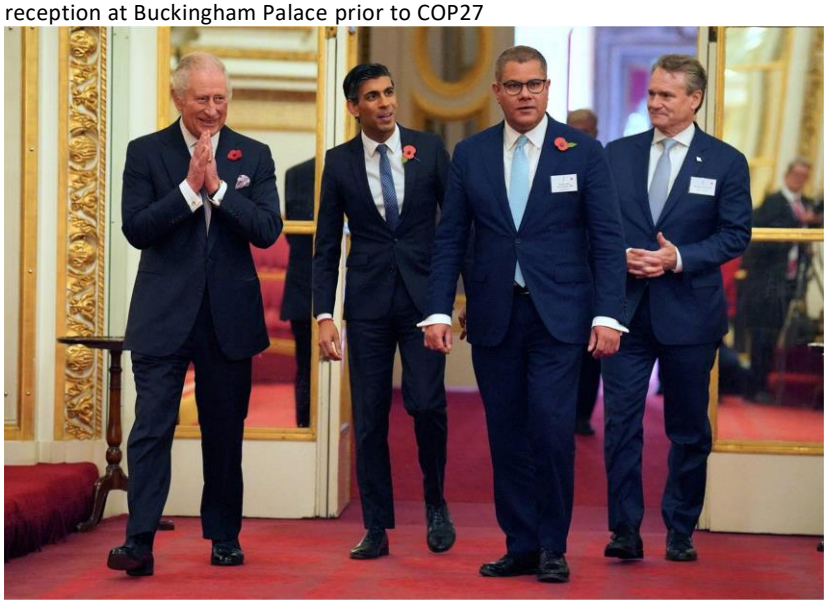
> "The COPs are mainly used as an opportunity for leaders and people in power to get attention, using many different kinds of greenwashing."

"As it is, COPs are not working"

"So, as it is, the COPs are not really working, unless of course we use them as an opportunity to mobilize."

She has a point. Greenwashing or not, there certainly is a lot of grandstanding and rhetoric. On Friday before the start of COP27, **King Charles** hosted a reception at the **Buckingham Palace** (photo) with over 200 international business leaders, decision makers and NGOs to mark the end of the United Kingdom's presidency of **COP26 in Glasgow** in 2021 and to look ahead to the COP27 Summit in Egypt. Attendees included UK's new Prime Minister **Rishi Sunak**, COP26 President **Alok Sharma**. and US Special Presidential Envoy for Climate **John Kerry**. The King gave a speech, and everyone had a wonderful time socializing. It was a good gesture on the part of King Charles, an environmental advocate, but how much good will come of such gatherings?

The King's speech
(Left to right) King Charles, Rishi Sunak, Alok Sharma and Brian Moynihan at a reception at Buckingham Palace prior to COP27



The climate reality, however, is stark, as noted by the latest UN report pointing out that much damage has already been done over the past 27 years while delegates have been convening at such summits. **Claire Fyson** at the nonprofit research group **Climate Analytics** characterized the progress as "Disappointing," noting that, "Few governments have really done anything to substantially move the dial."

According to **Climate Action Tracker**, only 21 countries had submitted updated national climate commitments; none include more ambitious goals. Meanwhile, the other 172 countries have not updated and/or have not adopted more ambitious targets. Those were the numbers going into COP27. Few more updated their pledges including a passionate speech by **Luiz Inácio Lula da Silva**, Brazil's president-elect, who said that saving whatever is left of the **Amazon** rain forest will be among his top priorities – in contrast to his predecessor. But those who have made pledges are not obligated to deliver, and frequently don't. Among the big emitters, only **Australia** filed a plan that included stronger, credible emissions-cutting commitments. Australia, however, has long been a laggard and its new commitments come from a very low baseline. While welcomed news, Australia has a lot of catching up to do. Asked to comment, **David Robinson** of the **Oxford Climate Policy**, who has been following COP events closely for many years, said

"If pressed for a message worth sharing, it is that COP27, like others, will continue to be an important annual meeting where governments, companies and civil society meet and showcase their ambitions and lobby. However, since the **Paris Agreement** rulebook was effectively completed in **Glasgow**, the real international political action will now happen elsewhere, at the **G20**, in bilateral **China-US** cooperation as well as in the financial space with major players including the **World Bank** and other lending institutions."

As noted by UN's Secretary General **António Guterres,** "Global and national climate commitments are falling pitifully short. We must close the emissions gap before climate catastrophe closes in on us all." According to Fyson, "It's not all doom and gloom, but it's (the UN-sponsored process) definitely not moving fast enough."

Most observers agree that what little momentum was gained at last year's summit in Scotland has *stalled* as the war in Ukraine, rising inflation and energy costs have distracted the attention of world leaders from climate.

Despite the disappointing news, there are some positive signs:

- The war in Ukraine has increased the resolve of many countries to further accelerate **renewable investments**. **Germany**, for example, which currently has less than 8 GW of offshore wind has set a goal of reaching 40 GW by 2035, and 70 GW by 2045;
- High energy prices – oil, natural gas, coal – make **energy efficiency**, always neglected and under-appreciated, more cost effective than ever (Box);
- With many corporations making **carbon neutrality** pledges**,** there is a chance that some may actually succeed;
- More **banks and financial institutions** are gradually moving away from financing fossil fuel infrastructure; and
- **Concerned individuals** are taking small steps and make small sacrifices towards reducing their carbon footprint.

Lovins: The cheapest energy resource is the one you don't use

The energy efficiency guru **Amory Lovins** (photo) made a name for himself by promoting **energy efficiency** as a cheap and plentiful energy supply option long before others joined the fray. From the start, he was controversial, non-conformist and, at times, outrageous – perhaps that is what made him famous. He challenged the conventional wisdom of the time – which still persists – by stating the obvious, namely the cheapest kWh is the one you don't use. He coined the word *negawatts*, stating that they are always cheaper than megawatts. The rest, you can say, is history.

The French newspaper ***Le Monde*** published an interview with Lovins on 31 Oct 2022 focusing on the current energy shortages and high prices in Europe. Lovins' message, unsurprisingly, was that the crisis will accelerate the move towards renewables and **energy efficiency**. He said that Europe could save up to 80% of the energy it currently consumes if it is efficiently used. **Putin**, he believes, is inadvertently accelerating the energy transition.

Lovins' message has not changed much over the past few decades. He has always challenged the conventional wisdom and has often been vindicated in retrospect.

Some, however, place him in the category of experts providing simple solutions to complex problems – which are certainly better than those who provide complex solutions to simple problems.

Negawatts cheaper than megawatts

Source: Le Monde 31 Oct 2022

The IEA, in its latest WEO (page 6), agrees with Lovins stating that energy efficiency and demand-side measures are not getting sufficient attention even though they are the most plentiful, cheapest and fastest resource to reduce energy demand and minimize customers' energy bills. ■

Le Monde interview w Amory Lovins
https://www.lemonde.fr/planete/article/2022/10/31/vladimir-poutine-vient-de-faire-exploser-l-ere-des-energies-fossiles_6147965_3244.html

A case in point is a professional colleague of the editor who traveled via train and ferry rather than flying from Germany to Morocco for a business meeting, a distance of 2,500 km. He estimates 93% carbon saving, which comes at the expense of a much longer travel time, 5 vs. 1 day. How many ordinary citizens will be willing to do similar things to reduce their carbon footprint?■

Carbon Inequality

The rich – individuals, corporations, countries – must cut emissions or pay for the damage caused

Among the many thorny issues on the agenda at COP27 was how to address the wide disparity between the big emitters, who tend to be rich and developed, and those suffering from the consequences of climate change, who tend to be poor and developing. The topic, called "***loss and damages***," previously on the back burner, has risen to the top of the agenda as the impacts of climate change inflict massive damage to countries least able to afford it. Unprecedented floods in **Pakistan**, for example, submerged a third of the country under water for a while draughts ravage parts of **Africa** resulting in crop failures, famine, and mass migration.

Lately, there have been calls to impose **carbon taxes** on the super wealthy – corporations as well as individuals – to raise funds for good causes. One such measure on the **California ballot** in Nov 2022, **Proposition 30**, known as **the millionaire's tax**, would have increased income taxes by 1.75% on those making more than $2 million a year to subsidize electric vehicles and pay for wildfire protection which has been exacerbated by a warming climate. The measure, which did *not* pass, would have raised up to $5 billion a year. But the idea, which is to go after the super wealthy individuals, corporations or countries is likely to remain popular for at least 2 reasons:

- First, that is where the money is; and
- Second, they are responsible for a large share of the global carbon emissions.

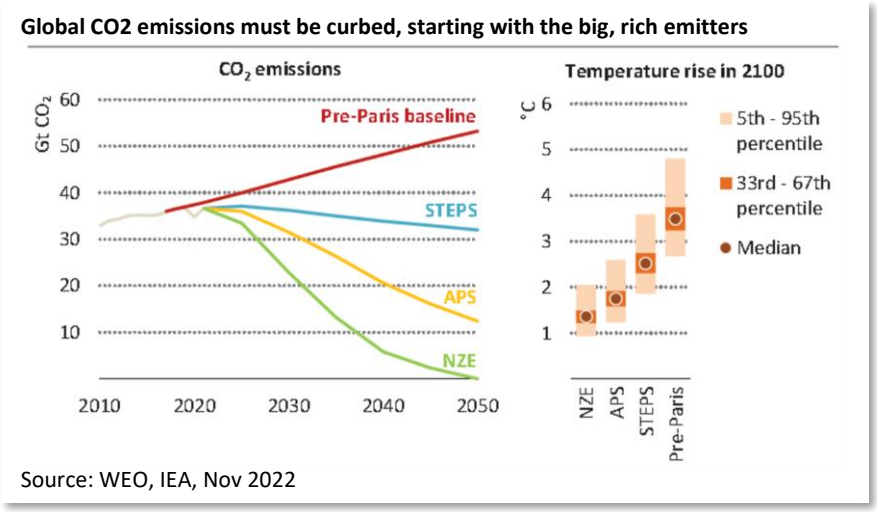
Carbon Billionaires: The investment emissions of the world's richest people, an **OXFAM** report recently released, examined the emissions attributed to 125 global billionaires. Unsurprisingly, it found that their personal emissions – from private jets, yachts, and lavish lifestyles – are *thousands of times* higher than those of the average mortal, which OXFAM characterized as totally *unacceptable*. But if the emissions from their *investments* are included, then the billionaires' carbon emissions are *over a million times* higher than the average global citizen.

OXFAM says that the investments of just 125 billionaires amounts to 393 million tonnes of CO2 equivalent (CO2e) each year – as much as from all French citizens. These billionaires have collectively invested **$2.4 trillion** in 183 companies, which amounts to 3m tonnes of CO2e per person per annum, a million times higher than 2.76 tonnes of CO2e for those in the bottom 90% of income bracket.

According to **Nafkote Dabi,** Climate Change Lead at OXFAM, "These few billionaires together have 'investment emissions' that equal the carbon footprints of entire countries like **France, Egypt,** or **Argentina**," adding that, "… investors at the top of the corporate pyramid have huge responsibility for driving climate breakdown. They have escaped accountability for too long." As Dabi sees it, "This has to change."

The world's wealthiest individuals' investments account for up to 70% of their emissions. Moreover, OXFAM found that on average 14% of their investments were in polluting industries such as energy and

cement, twice the average for investments in the **Standard and Poor 500** (S&P500). Only one billionaire in the OXFAM's sample had invested in a renewable energy company.



Based on its findings OXFAM says that the choice of investments made by billionaires not only impacts the future of the economy but also the future of global emissions. It says that if the billionaires in the sample moved their investments to funds with environmental standards, it could reduce the intensity of their emissions by up to four times.

Dabi believes that "The super-rich need to be taxed and regulated away from polluting investments … Governments must put … in place … policies that compel corporations to be more accountable and transparent in reporting and radically reducing their emissions." OXFAM estimates that a wealth tax on the world's super-rich could raise $1.4 trillion a year, which could fund developing countries seeking "loss and damages."

According to the UNEP adaptation costs for developing countries could rise to $300 billion per year by 2030. Africa alone will require $600 billion between 2020 to 2030 to cope with the worst effects of climate change. Where is the money going to come from?

The report says that many corporations are off track in setting their climate transition plans, including hiding behind unrealistic and unreliable decarbonization plans with the promise of attaining net zero targets by 2050. Fewer than one in three of the 183 corporates reviewed by OXFAM are working with the **Science Based Targets Initiative**, only 16% have set net zero targets. In other words, they are not moving in the right direction, and certainly not fast enough. ■

IEA: A Shock Of Unprecedented Breadth And Complexity

Putin's misadventures will leave Russia with a much-diminished position

The latest **World Energy Outlook (WEO), the International Energy Agency's** flagship report does not mince words when it states at the outset that, **"**The world is in the midst of its first **global energy crisis** – a shock of *unprecedented breadth and complexity*," adding, "Pressures in markets predated Russia's invasion of **Ukraine**, but Russia's actions have turned a rapid economic recovery from the pandemic – which strained all manner of global supply chains, including energy – into full-blown energy turmoil."

> "Russia has been by far the world's largest exporter of fossil fuels, but its curtailments of natural gas supply to Europe and European sanctions on imports of oil and coal from Russia are severing one of the main arteries of global energy trade. All fuels are affected, but gas markets are the

epicenter as Russia seeks leverage by exposing consumers to higher energy bills and supply shortages."

To shield the customers from the Russian gas curtailments,

> "…. Europe is set to import an extra 50 billion cubic meters (bcm) of **liquefied natural gas** (LNG) in 2022 compared with the previous year."

While switching from Russian gas deliveries via pipeline to LNG imports from more reliable sources may alleviate short run shortages, LNG is believed to be 10 times more carbon-intensive than gas delivered though pipelines. Hmm.

The IEA notes that "… this (transition) has been eased by lower demand from China, where gas use was held back by lockdowns and subdued economic growth, but higher European LNG demand has diverted gas away from other importers in Asia."

Clearly energy prices affect everything else in any economy,

> "The crisis has stoked inflationary pressures and created a looming risk of recession, as well as a … $2 trillion windfall for fossil fuel producers above their 2021 net income."

The US **President Joe Biden** has pleaded with the US oil majors to share some of the **windfall profits** with American consumers. Nobody is sure how such a scheme would work in practice. Listed oil and gas companies cannot simply be told to share their profits, just as they cannot expect the government to cover their losses should prices fall.

As the IEA notes,

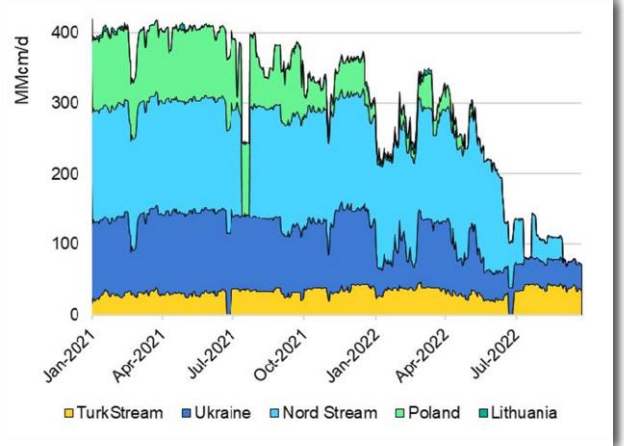
> "Higher energy prices are also increasing food insecurity in many developing economies, with the heaviest burden falling on poorer households where a larger share of income is spent on energy and food. Some 75 million people who recently gained access to electricity are likely to lose the ability to pay for it, meaning that for the first time since we started tracking it, the total number of people worldwide without electricity access has started to *rise*. And almost 100 million people may be pushed back into reliance on firewood for cooking instead of cleaner, healthier solutions."

Unsurprisingly, governments – mostly in developed economies – have thus far committed over $500 billion, to shield consumers from the immediate impacts of rising energy prices.

Short-term measures include:

- Increased reliance on coal-fired electricity generation in Germany;
- Extending the life of a few remaining nuclear power plants, also in Germany; and
- Accelerating the approval and construction process for new renewable projects across Europe.

Russian gas exports to the EU have been curtailed



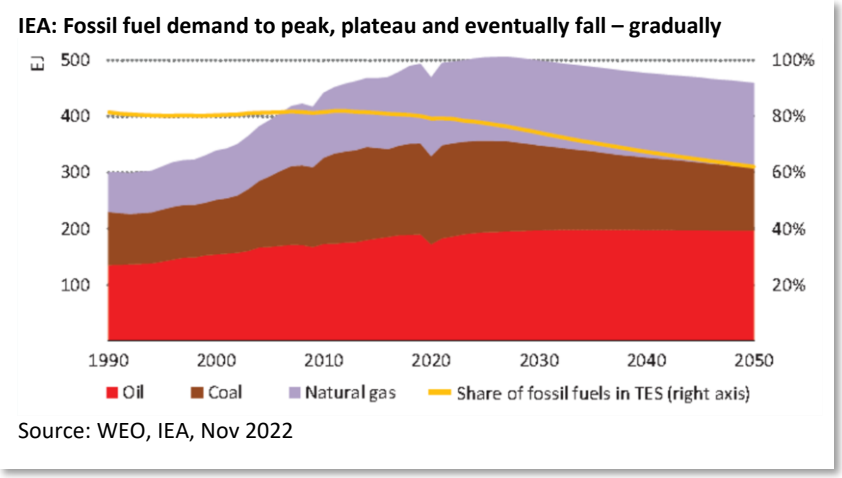
Source: IAE

The IEA notes that cost-effective **energy efficiency** and **demand-side** measures have generally received *less* attention than they deserve (box on page 4).

The IEA must be credited for walking into uncharted territory – for an organization whose foundation was to allocate scarce oil supplies in case of a supply emergency. The same IEA is now talking the unthinkable: **peak oil** and **peak fossil energy** as illustrated in the visual below.

The report's executive summary says

> "For the first time, a ***WEO*** scenario based on prevailing policy settings has global demand for each of the *fossil fuels exhibiting a peak or plateau*.**"**



In one of its scenarios, global **coal** use begins to decline within the next few years, **natural gas** demand reaches a plateau by the end of the decade and **oil** demand levels off in the mid-2030s before ebbing slightly to mid-century – due to the rising sales of **electric vehicles** (EVs). It says,

> "Total demand for fossil fuels declines steadily from the mid-2020s by around 2 exajoules per year on average to 2050."

This would be a radical departure from historical patterns. As noted by the IEA,

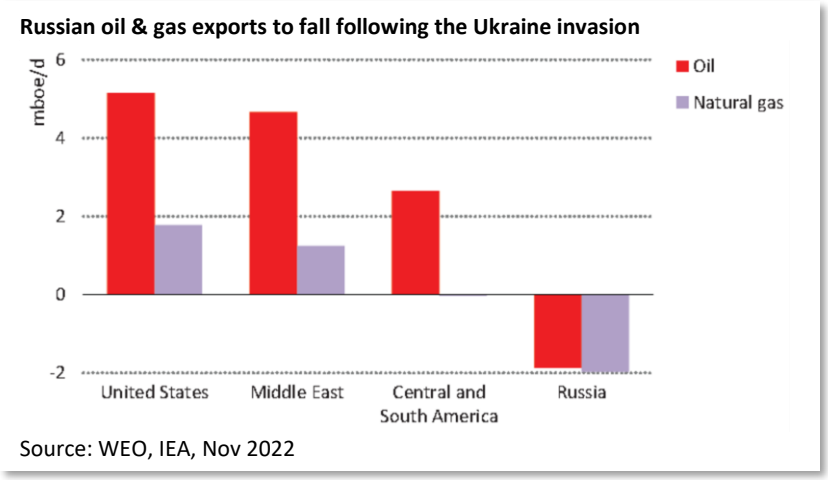
> "Global fossil fuel use has risen alongside GDP since the start of the **Industrial Revolution** in the 18th century: putting this rise into reverse while continuing to expand the global economy will be a pivotal moment in energy history."

The IEA's message is echoed by a recent report by DNV (article on page 14), which illustrates how such an energy transition can be achieved. The WEO notes,

> "The share of fossil fuels in the global energy mix has been stubbornly high, at around 80%, for decades. By 2030 in (one of the scenarios), this share falls below 75%, and to just above 60% by 2050."

Not surprisingly, once the peak fossil fuels is reached, global carbon emissions begin to fall.

> "A high point for global energy-related CO2 emissions is reached in the (STEPS scenario) in 2025, at 37 billion tonnes (Gt) per year, and they fall back to 32 Gt by 2050. This would be associated with a rise of around 2.5 °C in global average temperatures by 2100."



Source: WEO, IEA, Nov 2022

The IEA says, "This is a better outcome than projected a few years ago: renewed policy momentum and technology gains made since 2015 have shaved around 1 °C off the long-term temperature rise. However, a reduction of only 13% in annual CO2 emissions to 2050 in the STEPS is far from enough to avoid severe impacts from a changing climate."

While Russia's invasion of Ukraine is responsible for much of the current turmoil in the energy markets, the IEA is adamant that **President Vladimir Putin's** misadventures and gross miscalculations will leave Russia with a much-diminished position once Europe reorients its energy imports and trading relationships (visual above) – a conclusion shared by many analysts even though no one can be sure how and when the current conflict ends.

It reminds this editor of remarks by **Otto von Bismarck** in 1862 when he reportedly said, "Not through speeches and majority decisions will the great questions of the day be decided but by iron and blood." Putin seems determined to rely on iron and blood to get his way. The Western powers should unite in denying him that outcome. ■

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Utilities Moving Towards Bidirectional Flows

A novel rate option encourages EVs and electrified fleets to discharge into the grid

The days when utilities produced lots of power in large thermal central plants and transmitted it down the wires to customers have already changed as the electricity generation mix gradually shifts toward more renewable generation, both utility-scale and distributed – the latter as consumers produce, store, and consume some of what they need from solar panels on their roofs. Many of these *prosumers* generate more than they need during the sunny hours of the day – which they can feed into the grid and/or store in batteries or electric hot water tanks – if they have one – for later use. But the biggest and most significant **behind-the-meter** (BTM) asset that is being acquired in large numbers are **electric vehicles** (EVs), which are nothing but big batteries on wheels.

As is currently happening with small-scale storage devices, large EV batteries are ideally suited for storing energy from the rooftop solar panels or the grid when supplies are plentiful and prices are low. Why not release some of the stored energy back to the grid after the sun has set – when peak demand occurs,and prices tend to be high?

The technology to do this, **vehicle-to-grid** (V2G) is well-known but not currently well-developed. That, however, is about to change, promising to reverse the flow of electrons from customers' BTM assets to the grid.

As reported in the 2 Nov 2022 post in ***Utility Dive***, the **California Public Utilities Commission** (CPUC) approved an agreement reached on 20 Oct among **Pacific Gas & Electric Company** (PG&E), the **Vehicle-Grid Integration Council**, or VGIC, **Electrify America** – a major EV charging company – and

the CPUC's **Public Advocates Office** that offers a compensation mechanism for commercial electric fleets and bidirectional chargers that can provide much needed services to the grid while enhancing reliability.

In praising the CPUC's approval, **Ed Burgess**, VGIC policy director, said, "The CPUC's decision is a strong step forward for Californians and in support of the state's grid, implementing the nation's first dynamic export rate for EV charging customers," adding,

> "As ever-greater numbers of EVs hit the roads, this innovative rate option will allow EV owners to further benefit from their investment in clean transportation."

Charge them from the mid-day sun, discharge them at the end of the day

https://electrek.co/wp-content/uploads/sites/3/2022/10/MCPS-Bethesda-depot.jpg?quality=82&strip=all&w=1600

The V2G rate is expected to be implemented "as soon as practical" but not later than Oct. 2023, according to the agreement reached between the parties. Participating EV owners will be compensated for exports to the grid based on day-ahead hourly pricing. It is not clear why the same ruling does not apply to all utilities in California.

To encourage enrollment special incentives will be offered for the first year to electric school buses and larger vehicles based on the battery's size. EV owners and EV charging operators who are able to discharge up to 100 kW are eligible for $1,800; electric buses will receive $3,150 in incentives; those with larger batteries can get more – the incentives can total $6,560 in some cases.

Electric school buses (photo) offer exceptional opportunities not only because of their large batteries but also because they run on predictable schedules – usually sitting idle during the sunny mid-day hours, making them prime candidates to store cheap solar energy while allowing some of the excess stored energy to be fed back into the grid in late afternoon/early evening hours. Large fleets of commercial vehicles such as delivery vans and trucks also have large batteries, but they are extensively used during most hours of the day (and night) with inflexible schedules. They may be charged late at night or in early morning hours but may not be able to discharge during early evening hours.

Mike Gazda, a spokesperson for PG&E, told ***California Current*** that the project will initially focus on two-way vehicle chargers for electric buses. PG&E said it is working to "prepare the grid for 12,000 GWh of EV-related electric load and to improve processes to enable rapid, safe EV energization and interconnection" by 2030.

PG&E is currently home to the largest EV market in the US, with about 420,000 EVs in its service territory. It said that it could have as many as 2 million EVs charging from the grid and discharging back when needed. To get a sense of the scale of the California's EV market, roughly double these numbers since PG&E covers roughly the northern half of the state.

While there are many more privately-owned EVs, electric buses and commercial fleets offer much better opportunities for scaling up V2G programs not only because of their much larger batteries but also because their operational patterns are much more predictable.

As the electrification of the transport sector gains momentum, the opportunities to manage when, where, and how they are charged – and potentially discharged – will become critical. If poorly managed, the massive EV load will most likely crash the grid. If properly managed, it will help the integration of renewables into the grid. ■

Article
https://www.utilitydive.com/news/pge-launches-dynamic-export-rate-for-commercial-electric-vehicle-fleets/635622/?%3A+2022-11-02+Utility+Dive+Load+Management+%5Bissue%3A45726%5D=&%3A+Load+Management=

Traditional Utility Business Model Increasingly Challenged

Both the regulators and the incumbents must acknowledge the change

As the article on page 9 pointed out, the traditional utility business model is being challenged on multiple fronts usually because technological innovation allows better ways to deliver the same services at lower cost. Think of **Uber** or **Airbnb**. The incumbents, especially the **investor-owned utilities** (IOUs) who historically relied on earning a regulated rate-of-return on their capital investments are especially hard hit since the utility business is a zero-sum game: someone's gain usually comes at someone else's loss.

The Nov 2022 issue of this newsletter described a proposal by **Sunnova Energy International**, a large solar installer, to the **California Public Utilities Commission** (CPUC) to be allowed to build, own and operate privately-owned micro-grids serving newly built residential communities of 500-2,00 homes in California.

If approved, Sunnova would work with builders and developers of new residential neighborhoods building a community of super-efficient homes equipped with rooftop solar, batteries and efficient appliances centrally managed by Sunnova. The community's distribution network would be built from ground up with Sunnova optimizing generation, storage, consumption as well as trading energy and other services to the California grid. Sunnova claims that its application meets all of the CPUC's requirements while offering customers savings of 20% or better with superior reliability. It says if approved, it can take advantage of the **Biden Administration's Inflation Reduction Act** which offers a 30% tax credit.

California's 3 main IOUs, however, are adamantly against the proposal because it would be the end of business-as-usual by allowing competition from a new player in what has been their exclusive domain for over a century. And if Sunnova is allowed to compete with the IOUs, it won't be the last.

The IOUs argue that Sunnova aims to duplicate the utility's service without adequate oversight by the regulator. Clearly, they prefer to preserve the status quo, where only *they* can provide service and at rates set by the regulator.

Sunnova, on the other hand, has urged the CPUC to dismiss the IOUs' *sky is falling* claims, pointing out that the consumers in the master planned communities would be better off and there won't be any harm

done to the grid or other customers served by the IOUs. Sunnova's application is supported by 16 groups who say the CPUC should, at the minimum, hear the arguments before deciding.

Of course, there *will* be ramifications for other customers if Sunnova's proposal is approved because it could conceivably deprive the IOUs from at least a significant portion of their future growth opportunities. Their high retail rates, which are due to rise, will have to rise even more making them even less competitive compared to self-generation and future Sunnovas.

SCE is engaged in all-electric energy community in Southern California

https://img.energytech.com/files/base/ebm/energytech/image/2022/11/Oak_Shade_at_Shadow_Mountain_Microgrid_Community_Street_Scene.63650fb619214.png?auto=format,compress&w=1050&h=590&fit=clip

The CPUC finds itself in an unenviable position facing a bad and a worse option. If the regulator agrees with the IOUs, it may come across as being too lenient or sympathetic to their cause. If it agrees with Sunnova, it might open a floodgate to others who may wish to do similar things – and who will then protect the vulnerable customers who rely on the service provided by the regulated monopolies, despite all its flaws?

As reported in a 25 Oct 2022 post by ***Utility Dive*** the **Public Advocates Office** at the CPUC said the agency should dismiss the application because" …there are many regulatory issues related to multi-customer microgrids that the commission must address before determining whether [Sunnova's] proposal is reasonable." This editor does not find the argument convincing.

Sunnova is pushing back against the IOUs pointing out that the CPUC has said it wants to remove barriers to microgrid commercialization:

> "Required commercialization of microgrids does not mean leaving microgrid ownership and operation as the sole province of the large IOUs, who will not commercialize microgrids, but instead will monopolize them to the detriment of customers."

The **CPUC's microgrid rulemaking process**, which is focused on developing rules for utilities to own multi-property microgrids served by third parties has been under way for some time. In the meantime, more than a dozen organizations have said that the CPUC should hold a formal hearing on Sunnova's microgrid proposal so that its merits and flaws can be examined.

Regardless of the fate of the Sunnova's proposal, the IOUs' exclusive service area and business model is beginning to break down.

In early Nov 2022, **KB Home**, a big American homebuilder, announced that it was developing an all-electric, solar, and battery-powered microgrid community in Southern California (photo). A 7 Nov 2022 ***EnergyTech.com*** post reported that every home in the energy-smart community will feature efficient and

digitalized appliances, rooftop solar and backup battery with the entire community managed as a microgrid capable of operating independently even during grid outages.

To achieve this goal, every home will come with a 4.9-6.3 kW rooftop solar system and a 13 kWh battery with a larger 2.3 MWh community battery. Given the built-in energy-efficiency features, the homes are expected to generate nearly all their power needs.

KB Home has joined forces with the **Department of Energy** (DOE), solar installer **SunPower**, the Advanced Power and Energy Program at the **University of California, Irvine**, **Southern California Edison Company** (SCE), **Schneider Electric** and Korean carmaker **Kia** to build the new community in Oak Shade and Durango at its Menifee Shadow Mountain master project.

Ten houses in the community will take part in a **vehicle-to-house/vehicle-to-grid** experiment with **Kia**. The participants would not only be able to charge their EVs from rooftop solar generated within the community and/or cheap energy from the grid but can also feed the micro-grid and/or the macro-grid with excess stored energy in vehicle batteries.

Since EV batteries are much larger than the batteries that come with each home, this can be a game changer. A **Rivian R1S** with the extended range, for example, can store 135 kWh, over 10 times the 13 kWh home battery. Once the **vehicle-to-house/vehicle-to-grid** technology is perfected, it can turn many consumers into *flexumers* – that is they will be able to get power from the grid, from the home battery and/or the EV, or from the community's much larger battery. At other times, the reverse can happen with the EV feeding the home, the community battery and/or the grid.

Jeffrey Mezger, KB Home's CEO said, "Working with industry and academic leaders, we plan to explore how these energy-smart connected communities can help protect the environment and turn our homes into their own power centers designed to deliver resiliency while also reducing the overall cost of long-term homeownership."

If it sounds a lot like Sunnova's proposal, it is except that in this case the local IOU is on board; it will build and own the distribution network within the community. SCE must have decided that if you can't beat the competition, you better join them.

Similar examples where a third-party steps in to do what would have normally been done solely by a utility abound, either because the utility is unable or unwilling to do it or – most of the time – because someone else is willing and able to do it better, faster and at lower cost.

Puerto Rico's feeble electricity grid was devastated by Hurricane **Maria** 5 years ago. Much of the island still does not have reliable service and the local municipal utility is totally overwhelmed and understaffed to deliver basic services outside major cities. Which explains why **Sunrun**, another major solar installer, has decided to step in and fill the gap. As reported in a 2 Nov 2022 post by ***Utility Dive***, Sunrun announced that it was developing a 17 MW **virtual power plant** (VPP) for Puerto Rico's electric utility by aggregating rooftop solar generation from 7,000 homes.

According to Sunrun's CEO **Mary Powell**,

> "We're solving energy insecurity on the island by switching the (existing utility) model so that solar energy is generated on rooftops and stored in batteries to power each home, and then shared with neighbors."

This will create a "clean shared energy economy," she said.

As these examples illustrate, the traditional utility business model and the regulation that enabled it for over a century is breaking down at its seams. Regulators must acknowledge that the times have changed, and the old assumptions, rules and roles must change. Ditto for the regulated incumbents. ■

Utility Dive article
https://www.utilitydive.com/news/sunnova-california-puc-micro-utility-microgrid-proposal/634879/?utm_source=Sailthru&utm_medium=email&utm_campaign=Issue:%202022-10-26%20Utility%20Dive%20Load%20Management%20%5Bissue:45550%5D&utm_term=Utility%20Dive:%20Load%20Management

https://www.energytech.com/distributed-energy/article/21254103/kb-debuts-microgrid-communities-in-california?utm_source=ET+Transition&utm_medium=email&utm_campaign=CPS221104014&o_eid=3934I5521789E0B&rdx.ident%5Bpull%5D=omeda%7C3934I5521789E0B&oly_enc_id=3934I5521789E0B

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https://apple.news/A-dvhww-dQwaDc2fRvI4BbA

DNV's Energy Transition: Rapid And Extensive

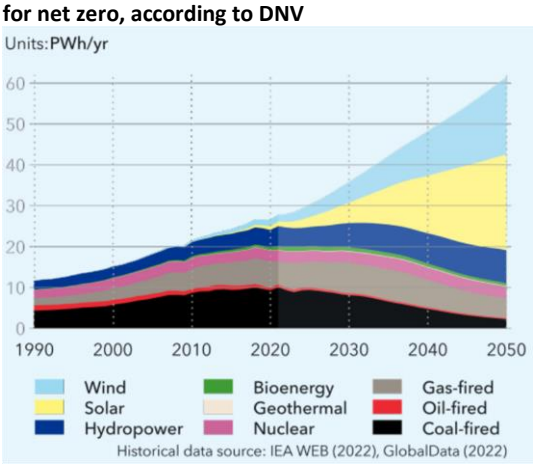
A sustainable future will be cleaner, greener and – surprisingly – cheaper

For several years, **DNV**, a Norwegian-based consulting firm, has been publishing an annual **Energy Transition Outlook** (ETO). Its 2022 report is an impressive effort that chronicles how *we* can transition to a cleaner, more sustainable and – surprisingly – more affordable energy future by 2050. Amidst the daily doom and gloom in the news, it is a refreshing message. The problem, however, is that it is not at all clear who is the *we*, and how it can keep some 200 independent countries that hardly agree on anything and whose citizens rarely agree among themselves to march along the DNV's prescribed pathway to net zero Nirvana. If the politicians cannot agree and stick to a plan, as demonstrated by the UN's annual COP conferences (page 2), will market forces and price signals ultimately lead us to that Nirvana? If not, how are *we* going to get there?

In its opening pages, the ETO says *we* must look beyond the immediate distractions of the **Ukraine** war and energy security issues,

> "Looking beyond today's high energy prices to see what the **longer-term energy future** holds is difficult. That is what this Outlook does. Our forecast considers the demand shock of the pandemic and the supply shock that came with Russia's invasion of Ukraine and concludes that those developments exert little long-term influence over a transition that will be rapid and extensive."

More hydrogen: Hydrogen will be only 5% of global energy demand in 2050, a third of the level needed for net zero, according to DNV



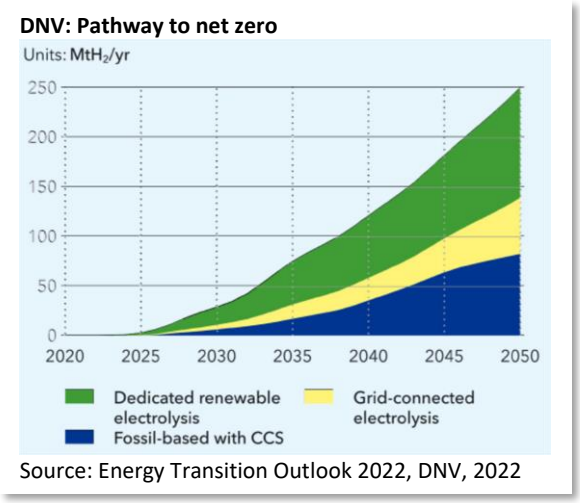
Source: Energy Transition Outlook 2022, DNV, 2022

In the short term, DNV notes that.

- High energy prices and a heightened focus on energy security due to the war in

Ukraine will not slow the long-term transition; and

- COP26 and the IPCC have called for urgent action which has not materialized: emissions remain at record levels *and* rising.



Source: Energy Transition Outlook 2022, DNV, 2022

In the long term, electricity will be the mainstay of the energy transition to net zero; it is growing and greening everywhere.

In this year's ETO, DNV has added a **Pathway to Net Zero** scenario (visual) that outlines what needs to be done by 2050 for the world to close the gap from the most likely 2.2°C trajectory that we are currently on to the 1.5°C future agreed in **Paris in 2015**, which appears all but impossible given the lack of progress to date.

It must be noted that there were suggestions from some countries at the COP27 to *drop* references to the 1.5°C target since nobody believes it can remotely be achieved given the recent trends – which shows *increased* rather than *reduced* emissions since 2015.

According to the IEA, global energy-related carbon dioxide emissions rose by 6% in 2021 to 36.3 billion tonnes, their highest ever level, as the world economy rebounded strongly from the Covid-19 crisis and relied heavily on **coal** – the dirtiest fossil fuel – to power that growth.

The increase in global CO2 emissions of over 2 billion tonnes was the largest in history in absolute terms, more than offsetting the previous year's pandemic-induced decline, the IEA analysis shows. The recovery of energy demand in 2021 was compounded by adverse weather and energy market conditions – notably the spikes in natural gas prices – which led to more coal being burned despite renewable power generation registering its largest ever growth.

While 2022 may be slightly better, we are no way close to where we need to be to avert a climate catastrophe, a message that was repeatedly heard at the latest COP27 in Egypt.

Clearly there is a big gap between the trajectory we are currently on and the one we need to get on as illustrated in graph on page 6. How do we go about closing this gap?

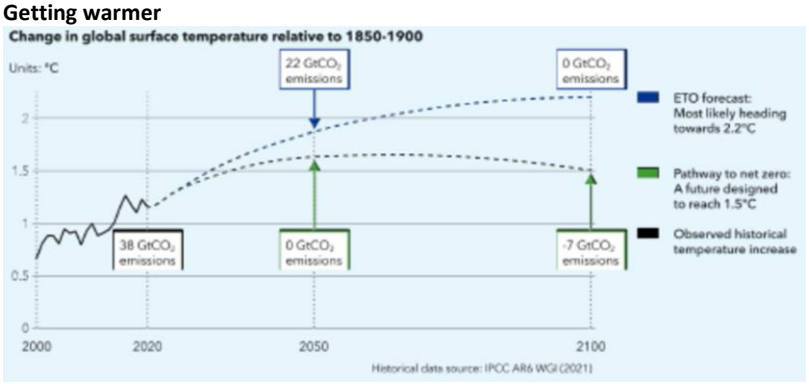
According to the ETO, the gap must be closed by a combination of obvious measures, the usual suspects,

- Reduced combustion of fossil fuels, replacing coal, oil and gas with renewables and nuclear;
- Improvements in energy efficiency; and
- Carbon capture and removal to make up any residual that is left over after the above two.

Most experts agree that ***negative emissions*** from bioenergy, direct air capture and natural-based solutions will be needed to get to net zero especially since global carbon emissions are currently rising rather than falling.

DNV portrays an encouraging timeline where the carbon emissions of fossil fuels are eventually *capped* and – believe it or not – *reduced* as the transition to a low carbon future gathers momentum. As illustrated in the schematic below, coal, oil and even natural gas will eventually reach their peaks and begin to dwindle, replaced by renewables and – one can assume – some forms of nuclear energy. Bust as noted in related article on page 25, don't hold your breath on a nuclear renaissance any time soon.

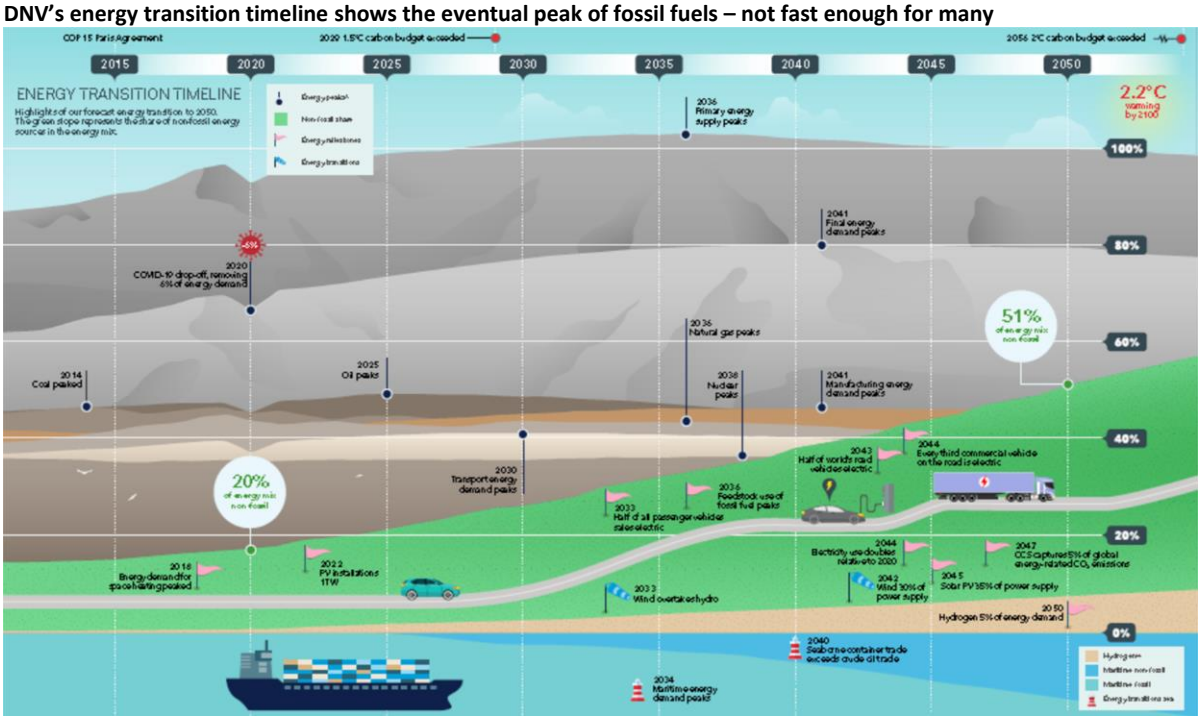
Getting warmer



DNV projects that the demand for oil, the dominant fuel for many decades, will reach a peak as its main source of demand, the road and rail transport sectors are gradually electrified (next page on left).

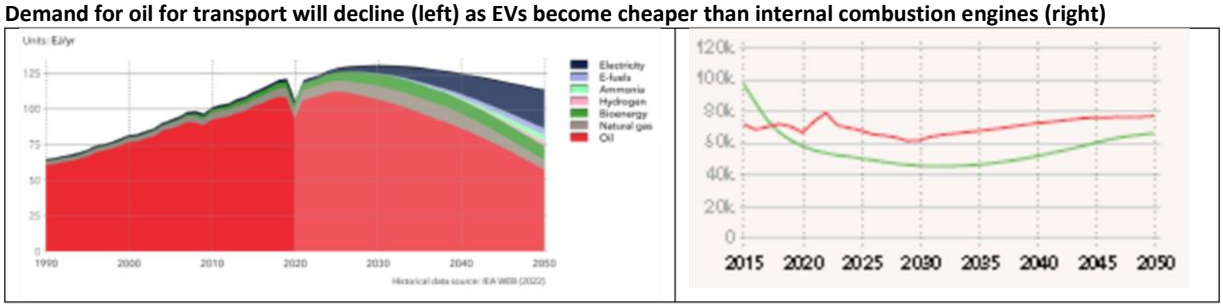
How and why would that happen crucially depends on assumptions about **electric vehicles** becoming cheaper than **internal consumption engines** (ICEs) in the coming years. As illustrated in next page on right, DNV, like many others, expects this cost crossover to happen soon, if it not already the case.

DNV's energy transition timeline shows the eventual peak of fossil fuels – not fast enough for many



Source: Energy Transition Outlook 2022, DNV, 2022

Demand for oil for transport will decline (left) as EVs become cheaper than internal combustion engines (right)



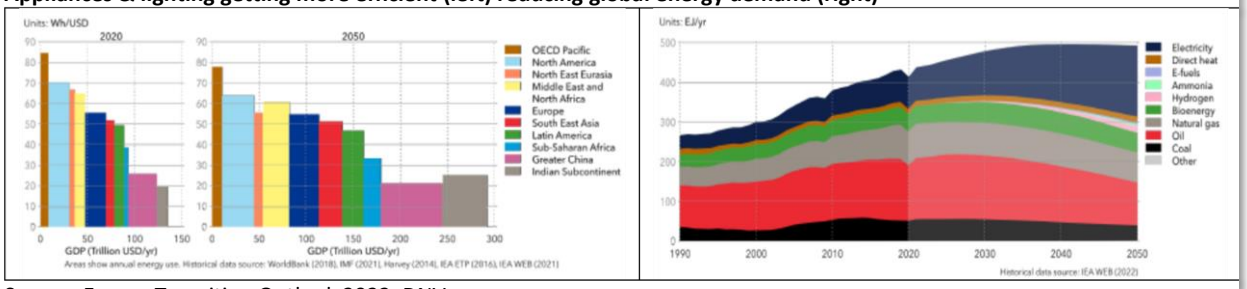
Source: Energy Transition Outlook 2022, DNV

Along the way, much more needs to be done. DNV examines various sectors, various regions, and numerous options in excruciating detail. For example, it explores how efficiency gains in lighting and appliances can reduce energy consumption in buildings, where the great majority of electricity is currently used (visual below left). The report is comprehensive, to put it mildly.

The bottom line, there are many, is a new global energy demand trajectory as illustrated in below right. More energy efficient appliances, lighting, homes, cars, heart pumps, etc. eventually lead to peak energy demand, according to DNV as the supply-side pivots to more renewables and more sustainable low carbon resources. No big surprises.

As time goes on and everything that can be electrified has been electrified, DNV examines the **demand on electricity generation** (visual next page, left) and vast investments that will be needed for the transmission and distribution networks of the future to cope with the resulting electrified future (next page, right).

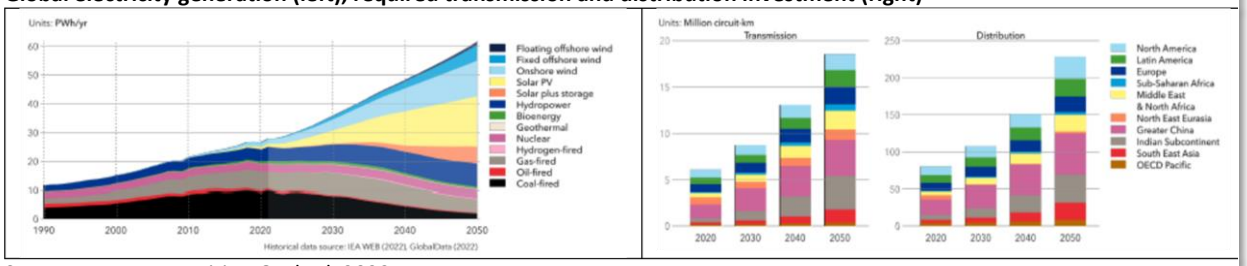
Appliances & lighting getting more efficient (left) reducing global energy demand (right)



Source: Energy Transition Outlook 2022, DNV

DNV's path to net zero resembles similar country-level studies done in the US, other countries or states such as California. What is different is that this is truly global in scope, like what the IEA has done in its latest WEO. The report devotes chapters to different regions including the global south where there is currently little energy infrastructure in place. The overwhelming message is the need for massive investment in new renewable sources of energy, which come with their own issues – variability plus equally large investments in transmission distribution, energy storage and so on.

Global electricity generation (left), required transmission and distribution investment (right)

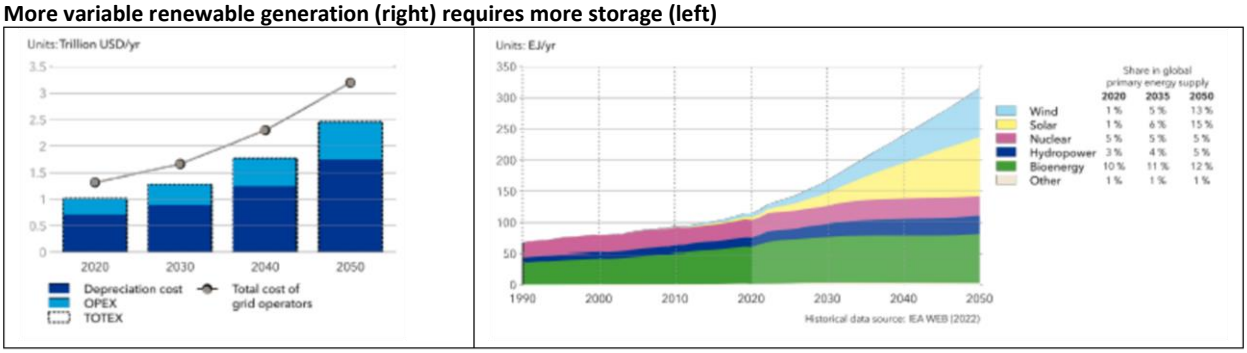


Source: Energy Transition Outlook 2022, DNV

This heavily electrified future, dominated by large amounts of variable renewable generation requires equally large investments in storage (below, on right) and balancing technologies.

These types of studies, which are usually done at state or country level, are hard enough to finance and implement. How or who will implement them on global scale and coordinate and harmonize all the moving parts, flow of investments and energy trade, is not entirely clear. The problem with energy is not different than climate change, lack of a unified mechanism to guide the various parts even when there is broad consensus on the desirability of reaching the end point – say limiting global temperature rise to 1.5-degree C. Setting targets is the easy part.

More variable renewable generation (right) requires more storage (left)



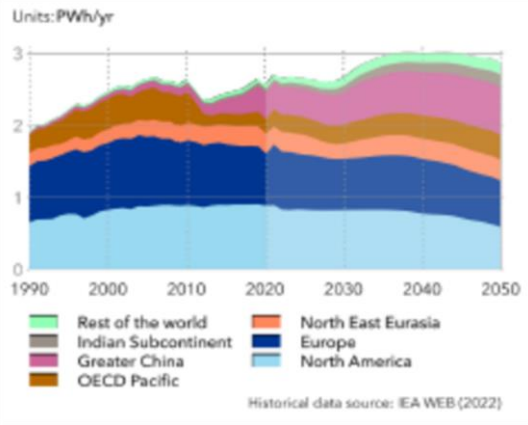
Source: Energy Transition Outlook 2022, DNV

What does DNV forecast as the role of **nuclear energy** in its zero net carbon future? As illustrated in the visual on page 19, it is not as big as nuclear optimists would have liked to see. The reality is that nuclear technology – while mature – has not delivered as promised or hoped for. DNV does not project a major turnaround.

Outside a few centrally-planned economies, it is currently shunned by private investors in the West, except for **France** and, to a lesser degree the **UK**, where the state continues to financially support them. In the US, two reactors currently under construction are likely to be the last.

That, of course, can change if the governments were to take an active role, if a hefty carbon tax were introduced, or if a new, lower-cost, modular version of the large nuclear reactors were to materialize. As further explained in related article on page 25, there are those who predict a future role for nuclear power but there aren't too many who subscribe to a commercial nuclear renaissance. Even **France**, which is aspiring to revitalize its nuclear power industry, has suffered serious and embarrassing setbacks in recent years as explained in the article on page 27.

Nuclear power: Some growth but not a renaissance



Source: Energy Transition Outlook 2022, DNV, 2022

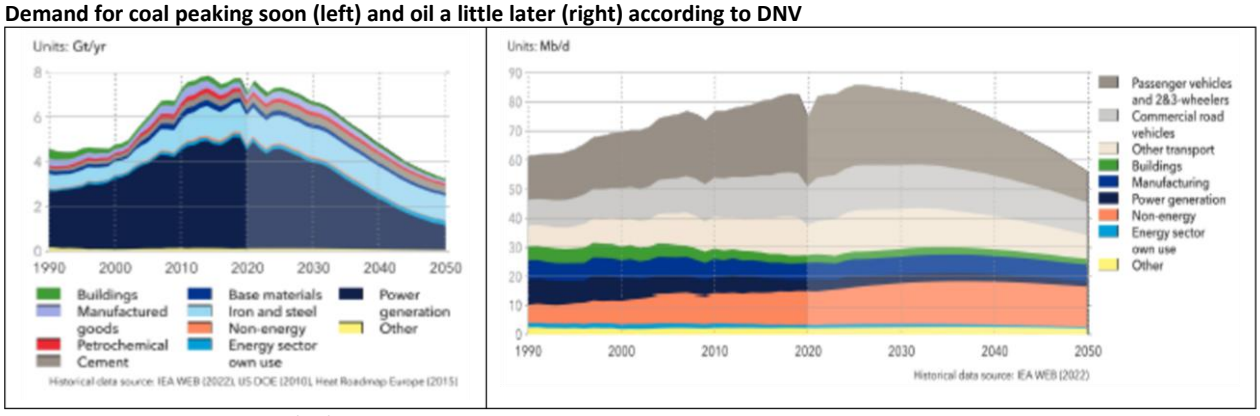
As for coal (visual below, on left) and oil (on right), DNV's projections see an approaching peak followed by a gradual fall or a plateau followed by eventual decline. Investors would give anything to know when.

Investment in coal has been falling in the US and the UK, it will fall across the EU once the war is over, but its fate in **China, Indonesia, Pakistan, South Africa** and a number of other countries remains to be seen. **Australia**, which is finally getting serious about reducing emissions under its new government, does not seem to be bothered by exporting coal for others to burn and emit carbon elsewhere even as it is trying to reduce its domestic carbon footprint.

There are other examples of such behavior, for example, in **Norway**, a major oil and natural gas exporter with some of the most ambitious policies promoting electric transportation at home.

The demise of oil, of course, has been greatly exaggerated in the past, and many oil exporting countries remain hopeful that their main source of revenues will last forever. They objected to any language even hinting of a gradual phaseout at the COP27.

Demand for coal peaking soon (left) and oil a little later (right) according to DNV



Source: Energy Transition Outlook 2022, DNV

The bottom line, as DNV sees it, is a dramatically different 2050 than what we have in 2020 as summarized in table on page 20. The energy flows – how primary energies are transformed into end use energy – will also be radically altered over the next 3 decades, according to the DNV.

DNV's analysis is thorough and the results utterly convincing on paper. The big challenge, as this editor sees it, is who will supervise this massive transition of the global energy system given so many players, some of whom don't want any part of the future that DNV says is where we must go. Why would, for example, OPEC members want to go along with this trajectory? Ditto for many major corporations who are perfectly content with the status quo and the business-as-usual. How can investors be persuaded to

move assets and funds into unknown and poorly understood ventures when the traditional ways seem perfectly profitable and predictable?

2020 vs. 2050: It'll be a different world

Units: EJ/yr

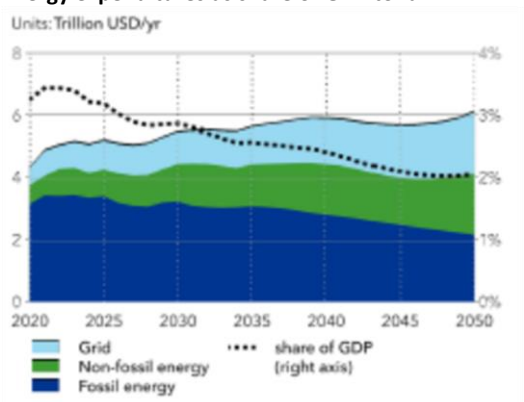
Source	2020	2030	2040	2050
Wind	6	20	44	79
Solar	5	21	57	95
Hydropower	15	21	27	29
Bioenergy	57	73	74	76
Geothermal	4	5	5	5
Nuclear	28	29	33	31
Natural gas	149	149	143	123
Oil	159	129	156	118
Coal	157	139	99	66
Total	579	635	638	623

Source: Energy Transition Outlook 2022, DNV, 2022

Crucially, it is often asked, even if such a net zero carbon future could be technically achieved – a big if – will it be remotely affordable? Many skeptics would say no to both questions. But not DNV. Based on its detailed analysis DNV emphatically concludes that,

"Far from coming at a green premium, the energy transition in fact involves a substantial green prize."

Energy expenditures as share of GDP to fall



Source: Energy Transition Outlook 2022, DNV, 2022

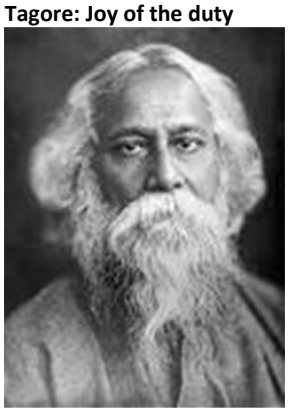
It says you can, in fact, have your cake and eat it too. DNV claims that global energy expenditures as share of GDP will in fact be *lower* than they would have otherwise been. A sustainable future, once achieved, will in fact be cleaner, greener *and* cheaper. That, of course, is a highly encouraging result.

What are DNV report's parting words?

> "World leaders of the 2020s will be remembered for either overseeing the continued expansion of unabated fossil- fuel use, or for successfully acting on science and the already overwhelming evidence of devastating climate damage."

On this point, the fate of the global energy transition, like the fate of climate, rests on political leaders who have not always done the best for their own constituents, let alone global citizens.

Tagore: Joy of the duty



Looking at history, for every memorable and honorable leader who did some good, one can find many who are not either, including a few who did some horrific things. How concerned is **President Putin** about the energy transition? Would the leaders of oil exporting countries be supportive of the transition away from fossil fuels? Reflecting on the joy that accompanies duty, the great Indian poet, writer and philosopher **Rabindranath Tagore** wrote,

"I slept and dreamt that life was joy,
I woke and saw that life was duty
I acted, and behold, duty was joy."

But among our current leaders or corporate CEOs how many see duty as joy? With the current global crises, how many of the world leaders are paying attention to or are concerned about their longer-term legacy? For some, making it through the winter is as far as they can go. ■

Technology Has Finally Arrived For Demand Flexibility

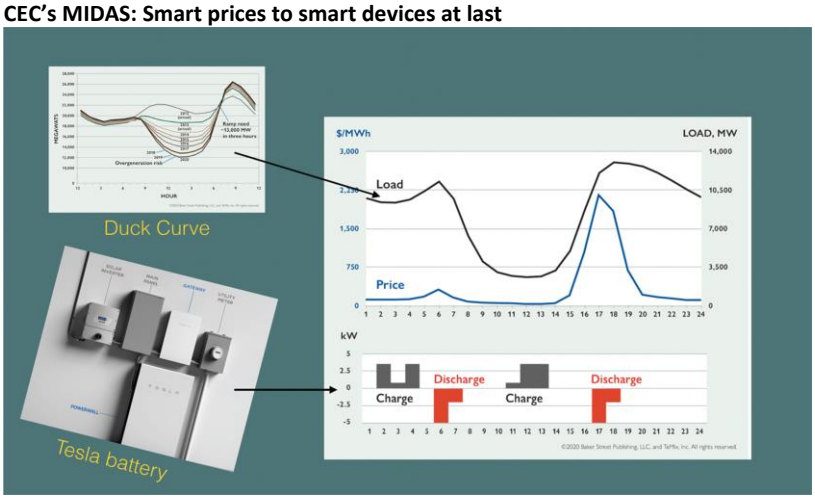
The promise of smart prices to smart devices is within reach

For more than 40 years, the **California Energy Commission** (CEC) has been pushing for **energy efficiency** savings that could be achieved if only smart devices in residential, commercial, and industrial sites could receive proper price signals in something close to real time. Likewise, the **Electric Power Research Institute** (EPRI) has been looking for a day when smart prices delivered to smart devices could result in smart electricity consumption. Countless papers and articles have analyzed the resulting savings that could accrue to consumers, the society, and the environment if such a dream were to become a reality.

In mid Oct 2022, the CEC approved new standards that would automate consumers' shifting of their electricity use away from times of high demand and prices to hours of plentiful supply and low prices. This will reduce the stress on the grid, particularly during multi-day heatwaves, cut down emissions from expensive and polluting peaking plants, and reduce utility bills.

After unanimously approving the **Market Informed Demand Automation Server** or **MIDAS** on 12 Oct, Commissioner **Patty Monahan** said the new user-friendly automated system would empower consumers while saving money. MIDAS is expected to increase **demand flexibility** by connecting smart devices to a statewide public database of utility real-time energy prices and demand, something that has not been done before.

CEC's MIDAS: Smart prices to smart devices at last

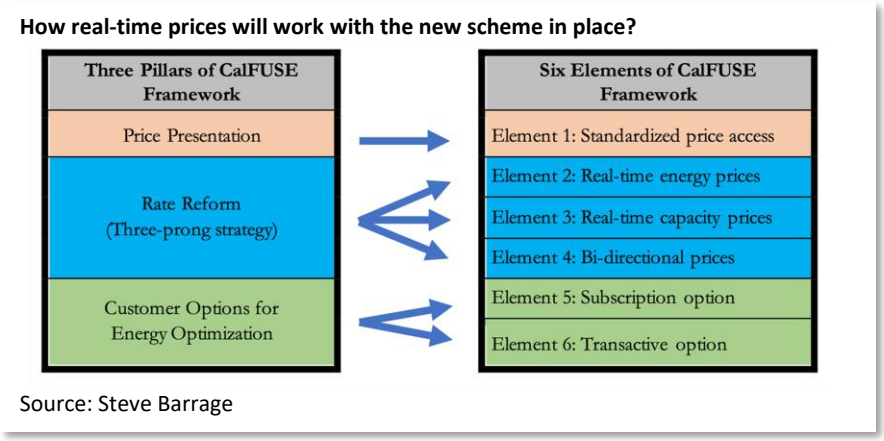


Source: Steve Barrager

Commissioner **Andrew McAlister** said MIDAS enables customers to shift their energy use to off peak times by allowing smart appliances, thermostats, electric water heaters, dishwashers, etc., to automatically respond to real-time price signals. This, of course, assumes that they are on time-of-use rates, which is a high priority for the regulator, the **California Public Utilities Commission** (CPUC).

With MIDAS in place, prices can be adjusted hourly or shorter. With so much variable generation resulting in big price spikes and dips, the expectation is that customers will be able to automatically adjust their consumption by using (and storing) energy when the grid is flush with cheap solar and wind resources while minimizing usage when the opposite is the case. This will reduce greenhouse gas emissions, help balance supply and demand while saving everyone real dollars. The data provided by MIDAS is currently available – from the website of the **California Independent System Operator** (CAISO) – but does not automatically reach smart devices.

The CEC expects MIDAS to produce $243 million in net benefits over 15 years and may reduce annual peak hour electricity use by 120 GWhs a year. According to the Commissioner McAlister, however, these estimates are "a gross undercount of long-term benefits."



The CEC expects MIDAS to reinvigorate **demand response** (DR) while encouraging new entrants to develop much needed load flexibility. Moreover, some experts believe that the introduction of MIDAS will finally force the CPUC to aggressively move towards wide-spread **time-of-use** (TOU) tariffs. There is no reason or excuse not to.

The CEC's new pricing scheme will also *democratize* real-time prices, previously available to large commercial and industrial customers only. The scheme comes at a critical time because of the rapid electrification of transportation and buildings, and the need to avoid adding to peak demand to protect the grid and climate.

The scheme will take effect in April 2023 and will initially apply to the 3 large investor-owned utilities (IOUs) – **Pacific Gas & Electric Company, Southern California Edison Company, San Diego Gas & Electric Company** – as well as **Sacramento Municipal Utility District, Los Angeles Water and Power**, and large **community choice aggregators** (CCAs) with others to follow.

All energy service providers are required to develop retail electricity rates that change at least hourly to reflect grid costs and greenhouse gas emissions. They must also maintain up-to-date rates in MIDAS – which will serve as the central repository for all time-dependent rates accessible to all smart devices.

The CEC developed a pilot statewide database of time-dependent electricity rates using data from CAISO in August 2021. MIDAS' aim is to create a statewide system that provides granular time and location dependent signals. Once in place, the agency plans to develop **appliance standards** that will eventually turn virtually every major electricity using (producing or storing) device and electric vehicle into *flexible load* and every consumer into a *flexumer*.

MIDAS is expected to spawn many new players who can serve as intermediaries or designated *agents* for consumers who wish to take advantage of the opportunity to reduce their electricity bills. One such entrepreneur, **Ed Cazalet**, the CEO of TEMix, a leader in implementing real time pricing and **transactive energy** (TE) said, "MIDAS is the first element of the CPUC's CalFuse that is being demonstrated with SCE, PG&E and Valley Clean Energy, a CCA in Northern California."

Steve Barrager, who co-authored two books with Cazalet on **Transactive Energy**, explained that the CalFUSE vision has six phases as spelled out in a recent white paper by the CPUC staff (visual above). The "prices-to-devices" functionality enabled by MIDAS which offers universal access to dynamic prices is phase one. Steps two and three offer prices based on marginal energy and distribution costs. Step 4 is a transition to bi-directional rates. In Step 5 customers are offered a subscription based on customer-specific load shapes. Step 6 enables transactive energy features. Steps 1 through 5 are currently being tested in the demonstration projects.

Interest in turning consumers into *flexumers*, of course, is not limited to California. Countries around the world, especially those with high penetration of variable renewable generation, are keen on doing the same.

As reported in 7 Nov 2022 issue of ***Energy Spectrum***, the UK's regulator **Ofgem** recently published a series of decisions to enable the implementation of the **Demand Flexibility Service** (DFS):

- Ofgem's first decision updated the terms and conditions for balancing;
- The second decision grants the **electricity system operator** (ESO) directions to allow the DFS to be procured; and
- A third decision made necessary changes to the license statements, including the Balancing Principles Statement and Procurement Guidelines Statement to reference the DFS.

Concurrently, the **National Grid Electricity Systems Operator** (NGESO) announced that following Ofgem's decisions it will offer **demand flexibility service** starting this winter. The service will allow electricity suppliers and aggregators to formally join by signing commercial contracts and working with their customers to ensure the highest levels of engagement and participation.

Ofgem has confirmed that ESO's service will be an opportunity for participating providers to benefit from a guaranteed acceptance price set at £3,000/MWh. NGESO expects the scheme to save the typical household ~£100 with the service running from 3 November 2022 to 31 March 2023.

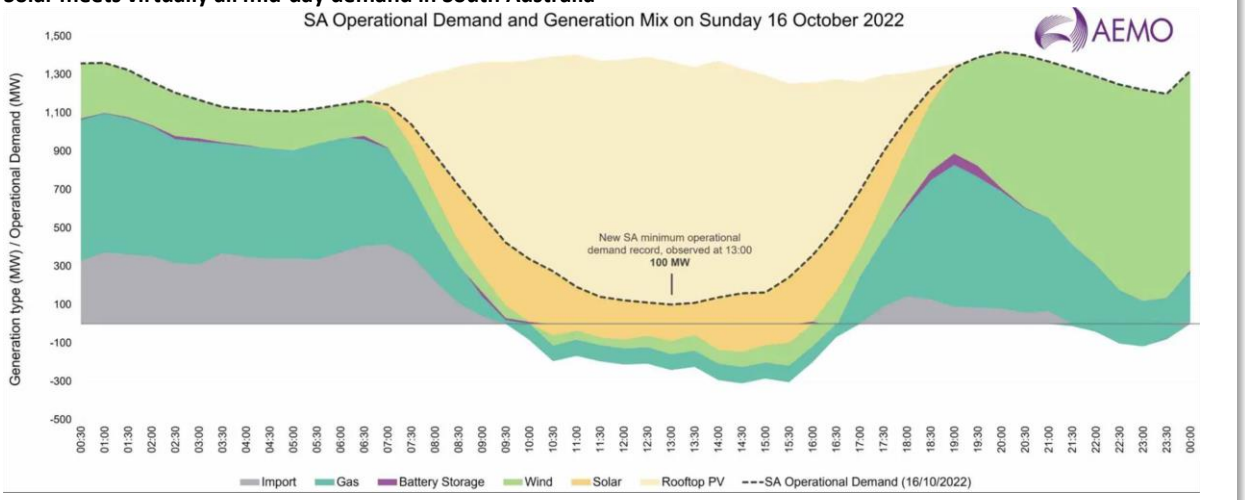
The specific details aside, there is a real need for demand flexibility and new as well as existing players will be encouraged to develop demand flexibility service – or whatever you wish to call it. ■

On Sunny Days Solar Meets All Demand In South Australia

In Australia the unimaginable is commonplace, but only for a few hours on sunny days

It was bound to happen, and it has. As reported in the 17 Oct issue of ***Renew Economy***, rooftop plus utility scale solar met South Australia's electricity demand for more than six hours on a recent sunny Sunday. It said, "… *operational demand* was nearly eliminated as it fell to a record low on the same day," 16 Oct. 2022. The new milestone was noted by the **Australian Energy Market Operator** (AEMO) highlighting "… the rapidly changing nature of (Australia's) electricity grids."

Solar meets virtually all mid-day demand in South Australia



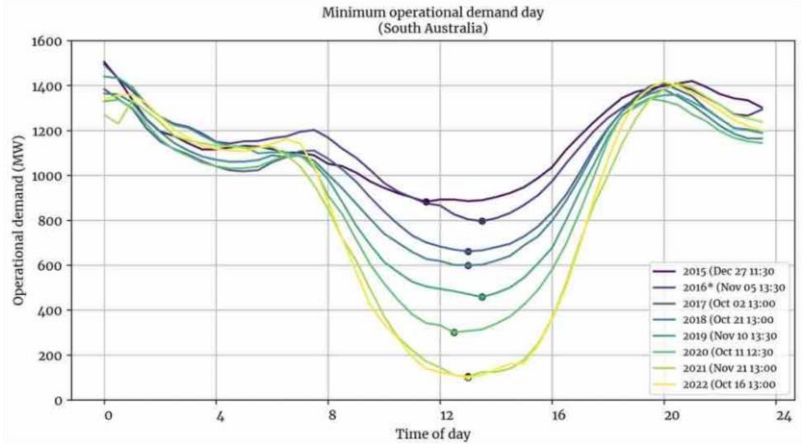
Source: Renew Economy, 17 Oct 2022

"According to AEMO, the minimum operational demand (i.e., that not provided by rooftop solar and other distributed resources) fell to a new record low of 100 MW at 1pm on Sunday (16 Oct 2022)."

"That was below the previous record set in November last year and is headed towards the one-time unthinkable benchmark of zero operational demand that AEMO expects to see in South Australia, possibly as early as this year."

"At the time, rooftop solar provided 92% of the state's power needs. That's not a record … but the combination of rooftop and utility-scale solar reached a new peak of 116.7% of demand (at least in a five-minute trading period), about one hour later."

The Australian "duck curve" shows the promise and challenges of solar energy



Source: Renew Economy, 17 Oct 2022

The accompanying graph tracks the falls in operational demand during daylight hours over the last 7 years. Over the last 12 months, wind and solar have provided an average of more than 65% of the state's electricity demand and are expected to average 100% in the next 5 years.

The speed of transition to solar and wind in parts of Australia have been dramatic indeed. Moreover, Australia is home to **Martin Green**, a professor at the **University of New South Wales** (UNSW) and a world renown solar PV pioneer (following article). ■

Martin Green Awarded For Reducing The Cost Of Solar PVs

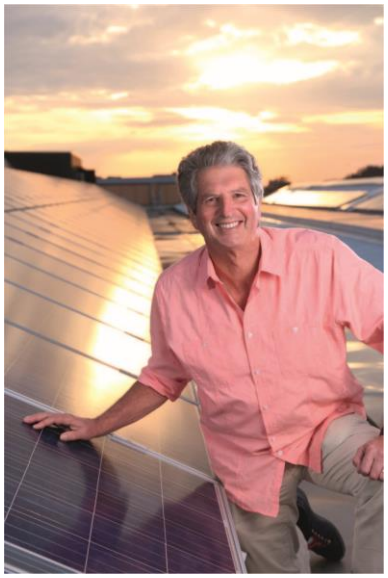
Solar cells are increasingly replacing large power stations the world over

In late Oct 2022 at a ceremony in Helsinki, Finland, **Martin Green**, a professor at the **University of New South Wales** (UNSW) was awarded the 2022 prestigious **Millennium Technology Prize** for his innovation that has improved the efficiency of solar PVs. The €1 million award recognized Green's role in the **Passivated Emitter and Rear Cell** (PERC) noting that since its development in 1983, the PERC has gone on to become the most commercially viable and efficient silicon solar cell technology used, accounting for almost 90% of the global solar cell market.

Green (photo) developed the PERC with his team by improving the quality of both the top and the rear surface of standard silicon solar cells. When photons enter a cell, they excite the electrons within the silicon, creating electric current. The technology has helped increase the conversion efficiency of solar cells by over 50%, from 16.5% in the early 1980s to 25% in the early 2000s. Green's innovation has

greatly reduced the costs of using solar panels, making solar energy more affordable than fossil fuels.

Martin Green: Well-deserved award



In accepting his well-deserved prize, Green said: "It is a great honor to have been selected to receive such a prestigious prize. It not only recognizes my contribution to photovoltaics, but also the achievements of my students and research colleagues at UNSW, as well as those of the broader photovoltaic research and commercial community," adding,

"I believe the Prize will increase my credibility as a spokesperson for what needs to be done to address climate change. We need to switch from fossil fuels to renewable energy to sustain the trajectory of human civilization on our shared planet. The pace of change is accelerating, and the world will shift to solar and wind energy over the coming decade. I believe a huge transformation of historic significance is underway."

"Solar cells are increasingly being used to replace large power stations that use fossil fuels. In 2021, 20 countries or regions including Australia, Chile, Germany, Greece, Italy, Netherlands, Spain, Vietnam and California generated between 8% to 25% of their total electricity supply from solar energy, with this number growing quickly."

Green and his team are currently working on combined cell technologies to reach 40% solar cell efficiency by exploring options such as stacking cells on top of each other. ■

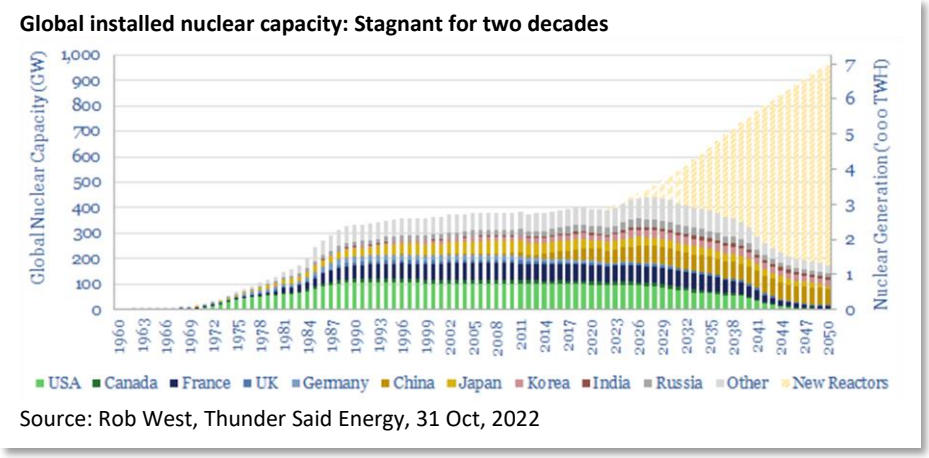
What Nuclear Renaissance?

A low carbon future needs more nukes. What is the hold-up?

The proponents of nuclear power never give up. The energy supply insecurity and volatility of fossil fuel prices following the Ukraine crisis, the climate crisis resulting from too much carbon emissions, and even the variability of renewable energy resources offer hope for nuclear energy. **France**, under President **Emanuel Macron**, seems determined to increase its reliance on nuclear generated power as do others like **South Korea** and **Japan**, the latter has been struggling to resume operations at existing nuclear plants that are deemed safe following the **Fukushima accident** in 2011.

The existing fleet of reactors with a capacity of around 392 GW generate approximately 2,800 TWhs of virtually zero carbon electricity per annum. But as noted on a 31 Oct 2022 post by **Rob West** of **Thunder Said Energy** (TSE), both numbers have been stagnant for two decades (middle part of the visual). What little is added in places like **China** are largely offset by closure of aging plants in the West, or in the case of **Germany**, by a political decision to phase them out.

For unexplained reasons, Rob West writes, "This is now changing. We expect a >3% CAGR through 2030 amidst energy shortages and hope for a 2.5x ramp through 2050," adding, "A 'nuclear renaissance' helps the energy transition." No disagreements with the final statement.

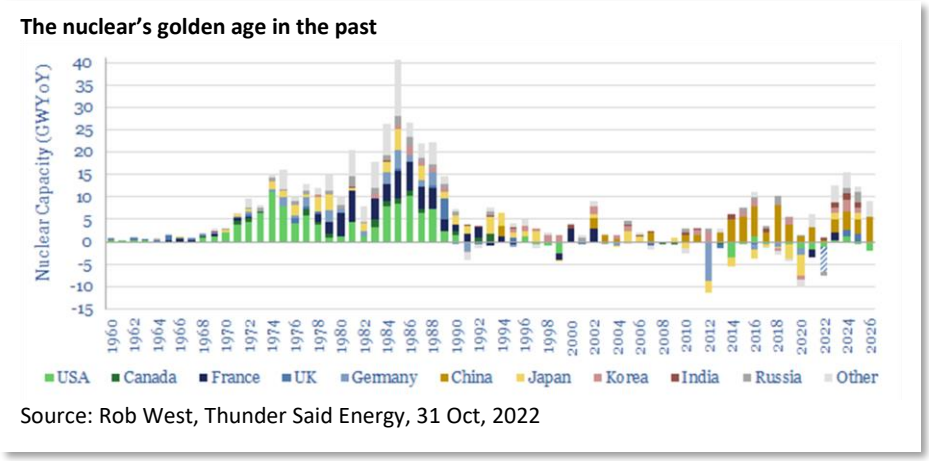


In a second post on 1 Nov 2022, Rob West notes that the global average age of operating plants is 36-years old, 42 years in the US which currently has the biggest inventory, around 95 GW. The reason? US nuclear additions peaked in 1984-89 and have been in decline ever since (visual below). Some 200 reactors have shut down globally – while not many are being built or planned.

Rob West says that "Western plants are not shuttering because they are at 'end of life'", but because of policy – or lack thereof. He believes that the current energy crisis "… will change that policy, and possibly also accelerate existing construction projects." He may be right, but this editor is not aware of any major policy changes anywhere except France.

While Rob West's assessment may be true for a few countries, for example, **France**, it does *not* apply to others. Even if **Japan** were able to resume operations at some of its existing reactors, it is hard to imagine a massive nuclear buildout. What is illustrated on the extreme right end of the visual above is *not* supported by evidence to date and even if it were to happen, it would take a decade or more given the recent experience in building new reactors in the West. While it may help avert future energy crises, it would certainly not help with the current one.

Only **Chinese** and, to some extent, **South Koreans** can still build them, and relatively fast. Rob West does not provide evidence to the contrary. **Germany**, which is facing major energy shortages, has decided to continue operating its 3 remaining reactors but only through April 2023. There is no change in German nuclear policy, not in Italy, or anywhere else in Europe.



There has been talk about **small modular reactors** (SMRs) for some time. This editor will not hold his breath until one is successfully completed and starts operating somewhere. ■

Just When Needed, The French Nukes Disappoint

EDF delivers less just when Europe needs more

With the approach of winter when Europe needs more nuclear generated power from France's 56 operating reactors, its operator ***Électricité de France*** (EDF) announced more problems and more outages at its reactors resulting in less output in the coming months. The state-owned utility said it was expecting extended outages at four reactors and maintenance delays at others. The news sent wholesale electricity prices in France for the middle of winter to above €1,000/MWh – roughly $1,000/MWH at current exchange rate.

This would have been embarrassing for EDF in normal times. With the current curtailments in Russian gas supplies to Europe, it was even worse.

Top 5 nuclear generators, 2020 data with French numbers down for 2021-22

Top five nuclear electricity generating countries	Total annual nuclear electricity generation in billion kilowatthours (BkWh)	Nuclear share of total national annual electricity generation
United States	789.88 BkWh	19.5%
France	379.50 BkWh	68.5%
China	366.30 BkWh	4.8%
Russia	215.75 BkWh	21.0%
South Korea	152.33 BkWh	27.7%

As reported in the press, roughly half of France's 56 reactors are out of action or not operating at full capacity due to scheduled or emergency maintenance problems.

The timing is particularly bad as France would normally consume the output of some 45 GW of nuclear capacity in a cold day in January but recently only 25 GW are online.

France, which was ranked behind only the US and slightly ahead of China in nuclear generation in 2020 (table) has fallen behind due to maintenance problems at some of its aging reactors.

EDF's nuclear problems casts doubts on its ability to build the 2 new reactors in the UK as well as President **Emanuel Macron's** desire to increase the country's nuclear generation capacity partially in response to the energy supply security issues emanating from the war in Ukraine. ■

Reader's Write

The article titled **Incumbents prefer the status quo. Surprised?** which appeared in the Nov 2022 issue of the newsletter generated a number of comments from readers. **Richard McCann** wrote,

> "I believe the CPUC sees an unsustainable path for rates but fantasizes that it can charge income based fixed charges while somehow preventing the wealthiest customers from walking away, and somehow their new "advanced dynamic" rates will solve the remainder of the revenue problem. That's part of what I wrote about in my chapter. A lot of cognitive dissonance because to admit otherwise means admitting that the policies of the last two decades have largely failed financially. The (California) Governor and Legislature don't want to hear that."

Lorenzo Kristov wrote,

> "Seems to me the intellectual constraint has not changed from what it's always been. All solutions must stay within the frame of maintaining the existing CPUC-regulated monopoly IOU structure. Anything outside that frame is unthinkable, almost invisible, certainly unimaginable. If we want something different we have to build it, from the bottom up. Affluent customers are doing it anyway, we just need to make the democratized energy future available to everyone.
>
> As noted by **Buckminster Fuller**, 'You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.' "

Commenting on the article on the **Social cost of carbon**, **Jeremy Webb** noted that (edited & abbreviated)

> "At the current EU carbon price of around $68 green hydrogen becomes more economic than blue hydrogen…. An excerpt from the latest IPCC Working Group III report (IPCC, 2022) estimates that the carbon price consistent with limiting global warming to 2°C or 1.5°C. is $170-290." ■

EEnergy Informer in the News

Selected articles from the ***EEnergy Informer*** are regularly reprinted in other publications including in ***Renew Economy***, Australia, ***Energy Spectrum***, UK, ***Vector*** and ***Energize*** in So. Africa, ***CA Current*** in California and ***CleanTechnica*** and ***The Energy Central***, among others in the US. The following articles were reprinted last month in other publications.

A virtual symposium on the edited book **Energy Communities** (see below) organized by the **Florence School of Regulation** took place on 19 Oct with the recording available at https://www.youtube.com/watch?v=oVxWVHFx9vM

Incumbents prefer the status quo. Surprised? appeared in the 26 Oct issue of ***CA Current***

Solar panels with batteries are moneymakers appeared in the 7 Nov issue of ***Energy Spectrum.*** ■

Just Published

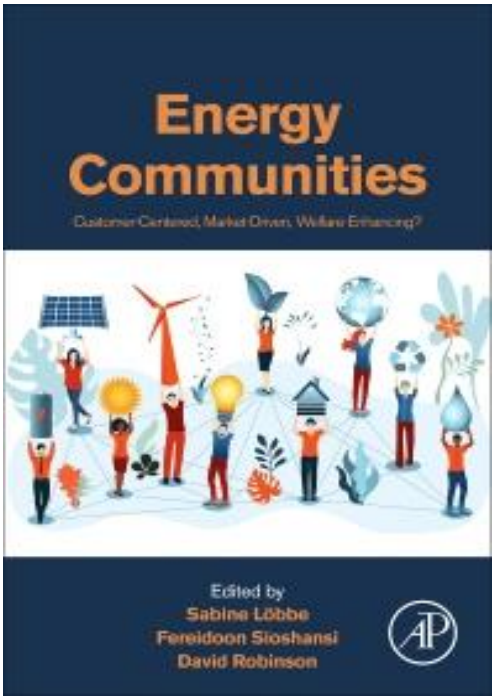
Energy Communities: Customer-centered, market-driven, welfare-enhancing?

Edited by Sabine Löbbe, Fereidoon Sioshansi & David Robinson
Academic Press, July 2022
Paperback, 514 pages
$165; 30% discount with code ENER30
ISBN: 9780323911351
Available from Elsevier at
https://www.elsevier.com/books/energy-communities/lobbe/978-0-323-91135-1

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.



Copies may be ordered at **30% discount** using code **ENER30** at https://www.elsevier.com/books/energy-communities/lobbe/978-0-323-91135-1 ■

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.

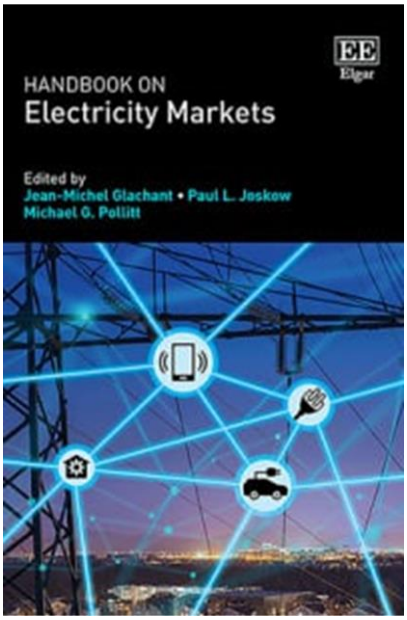
It examines the benefits and the limits of competitive markets while looking at specific markets such as the UK, PJM Interconnection, Texas, Australia, Scandinavia, continental Europe and China including their design features. The book also considers new emerging business models, as well as the impact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

Copies may be ordered from the publisher at https://www.e-elgar.com/shop/usd/handbook-on-electricity-markets-9781788979948.html or Amazon at https://www.amazon.com/Handbook-Electricity-Markets-Jean-Michel-Glachant/dp/178897994X ■

Yet another book for your crowded bookshelf: Handbook on Electricity Markets



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EEnergy Informer

Copyright © 2022
December 2022, Vol. 32, No. 12
ISSN: 1084-0419

http://www.eenergyinformer.com

EEnergy Informer is an independent newsletter providing news, analysis, and commentary on the global electric power sector.

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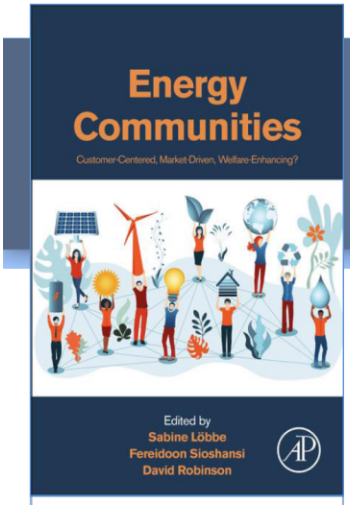
Published monthly in electronic format.
Annual subscription rates in USD:

Regular	$450
Discounted	$300
Limited site license	$900
Unlimited site license	$1,800



Energy Communities

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

Edited by Sabine Löbbe, Fereidoon Sioshansi & David Robinson

ISBN: 978-0-32-391135-1
EDITION: 1
PUB DATE: July 2022
LIST PRICE: $165.00
FORMAT: Paperback
TRIM: 7.5w x 9.25h
PAGES: 514.

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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