CLIMATE CHANGE BUSINESS JOURNAL®

The Energy Transition & the Climate Change Industry 2023

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How Goes the Energy Transition?

Consensus Lacking on the Urgency of the Climate Imperative

As the litany of evidence piles up on the societal and economic ravages of climate change, the pressure and urgency to take more meaningful steps about reducing greenhouse gas emissions and preparing to adjust to harsher climate scenarios increases—and seems to bring new actors onto the climate change industry stage with every passing month.

Climate change scientists, theorists or what now could be called sages long talked of 'tipping points' where the presumably indelicate balanced equilibrium of atmospheric chemistry, global weather patterns, and natural ecosystems would be shattered, raising the potential for catastrophic impacts with little that mankind could do to stop them.

Even today in the middle of 2023 with abundant evidence of these escalating impacts, it may still be alarmist to say there is little we can do to stop them, but surely there is a lot we can do to slow these impacts down, to minimize them or to adapt to them. This of course is the business challenge of the climate change industry as CCBJ has defined it — and an increasing number would say the existential challenge of our species, but as a business publication we don't want to lapse into further alarmist thinking.

Suffice it to say that there is a continuum amongst national, global and corporate leadership from 'maintaining the status quo' to 'the sky is falling'. Examples abound but here we focus on the United States of America and the current divide between its lead agency providing energy intelligence

The Energy Transition & the Climate Change Industry

Climate Change Business Journal assesses where we are in the energy transition in 2023 with a review of U.S. government energy and emissions data and forecasts, comparing business as usual with long-term net zero strategies. A review of venture activity and 10 company profiles in executive Q&A form reveal key trends.

Energy, GHG Emissions and Industry Scenarios: EIA vs. The White House: The U.S. Energy Information Administration expects U.S. energy-related carbon dioxide emissions to increase in 2023, but likely for the last time. EIA's long-term outlook only has CO2 emissions falling only by one-third by 2050, well behind the White House and NDC pathway outlined in The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050 3

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To order or for more information call (619) 295-7685 x 15, email info@ ebionline.org, or go to www. ebionline.org, where you can also sign up for email newsletters. and the leadership in the White House. So to ask the question: How goes the energy transition? One first has to ask the question where is it aiming to go, and what grand forces may be guiding it?

At the end of 2021 the Biden Administration through the office of the White House issued The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050. As the name implies the outcome was multiple strategies, pathways and scenarios with the ultimate end of net zero emissions by 2050 for the United States. The report was also the administration's work product to submit the Nationally Determined Contributions (NDCs) or climate action plan to cut emissions and adapt to climate impacts that each party to United Nations Framework Convention on Climate Change's 2015 Paris Agreement is required to establish and update every five years.

Meanwhile across Washington DC at the U.S. Department of Energy, the Energy Information Administration, the principal source of current data used by the White House on energy generation, costs, pricing, fuel mix, emissions and all things energy, continues to crank out periodic updates of its Short Term Energy Outlook and Annual Energy Outlook. The AEO forecasts scenarios of energy use and emissions out to 2050, but with no target outcome for its scenarios other than a range of accuracy based on economic and 'zero-carbon technology cost' factors.

One might expect or even hope that these two sets of scenarios would have more similarities than differences, but this is not the case as demonstrated in the following curated summaries by CCBJ. Admittedly we in a free democratic society that encourages independent thought, and likewise we expect and even hope that these agencies in the government have differing opinions, and don't coordinate a narrative of propaganda to sway the public, investors, industry or the international community. However, the difference of the endpoint of the LTS net zero emissions by 2050 and the EIA's 2050 endpoint at onethird reductions of the U.S. six gigatons of CO2 energy emissions down to four GTs is alarming, to say the least (see chart on page 4). The LTS admits that its 2030 interim and 2050 final goals are 'ambitious', but also states categorically that net zero is 'achievable'—and in so many words in the introduction, executive summary and conclusion that net zero is imperative.

The urgency to make serious commitments to this imperative is shared by a majority of the progressive community, and indeed likely by the majority of the population, and by association their elected representatives. So why does the Energy Information Administration not include such a scenario or pathway in its main long-term forecast it publishes in its widely cited Annual Energy Outlook?

Rather than try to solicit a response that would likely cite the use of best available data on use, production, resource supply, and economic data, one can only speculate. The Europe-based global equivalent to the EIA, the International Energy Agency (IEA) produces a similar variety of data sets and in 2021 published Net Zero by 2050: a Roadmap for the Global Energy Sector. Well regarded and much cited reports by BP, including the most recent BP Energy Outlook contains 'Net Zero' as one of its three scenarios. Countless governments around the world fulfilling their NDCs and a similar number of non-governmental organizations have painted and published their own net zero scenarios.

And not to single out the U.S. EIA as the only entity not charting a pathway to global sustainability, as there are others foreign and domestic. But with the mounting evidence that the atmosphere and global systems may be spiraling out of tens of thousands of years of relative equilibrium, it is certainly a wise insurance policy, and hardly an alarmist approach, to fully embrace and invest in a net zero strategy.

Allume Energy's SolShare Software and Service Opens Access and Broadens the Base of Distributed Solar

More than 15 million people in the U.S. live in low and medium rise apartment buildings, with roof space for solar but no way of accessing it. Allume Energy has developed a world-first technology, SolShare, which enables fair sharing of solar energy from a single rooftop solar PV system amongst multiple dwellings within the same building. This breaks down the technical and ownership barriers that have historically prevented apartment residents from accessing cheaper and cleaner energy from the sun. With an established market in Australia, Allume is now growing rapidly in the UK and the U.S.

Mel Bergsneider is Executive Account Manager at Allume Energy, responsible for business development in the U.S. market. As the first US-based employee at Allume Energy, Mel leads the Australian-born startup's expansion across target markets such as California, New York, and Florida. Mel works closely with affordable housing providers, solar installers, and real estate developers to provide solar energy benefits to participating tenants.

CCBJ: Most solar energy forecasters continue to assert that the vast majority of solar electric generating capacity will be installed at utility scale, citing efficiency and a lower cost for kilowatt hour produced. How do you counter that argument and advocate a larger share for distributed solar and the unexplored markets beyond standard institutional, commercial and residential solar?

Mel Bergsneider: Balancing utilityscale solar for efficiency with distributed solar and exploring new markets can foster grid resilience, local economic growth, and sustainability while empowering communities and promoting a diverse, futureproofed energy landscape. A diversified energy mix that includes distributed solar can provide a more resilient and adaptable energy system, capable of integrating new technologies, storage solutions, and changing energy demand patterns. Here are a just a few reasons distributed rooftop solar is a necessary part of the energy landscape:

Resilience and Grid Independence: Distributed solar, such as rooftop installations, empowers individual consumers and communities by providing them with greater energy resilience and grid independence. By generating electricity closer to the point of consumption, distributed solar reduces the reliance on long-distance transmission lines (which come at an increased cost per kW), minimizing the risk of blackouts and enhancing energy security. In addition, distributed solar, when combined with energy storage technologies, can contribute to grid stability and resilience. By incorporating battery storage systems at distributed sites, excess energy can be stored and discharged during periods of high demand or when the grid faces disruptions. This distributed storage approach can support a more robust and flexible grid infrastructure.

Local Job Creation: Distributed solar projects require a higher number of installations, leading to increased local job creation. This decentralized approach can stimulate economic growth by supporting a broader range of small and medium-sized businesses involved in the design, installation, and maintenance of solar systems. It promotes local entrepreneurship and reduces reliance on a few large-scale projects.

Environmental Benefits: Distributed solar systems located on rooftops or small-scale installations reduce the need for land use compared to utility-scale solar farms. Preserving open spaces and agricultural lands is crucial for biodiversity and ecosystem preservation. Additionally, distributed solar can help mitigate transmission losses associated with long-distance power transmission, resulting in a more efficient and environmentally friendly energy system.

Access to Energy for Underserved Areas: Distributed solar offers an opportunity to bring electricity to remote and underserved areas that are geographically challenging for large-scale projects or lack grid infrastructure. Off-grid and minigrid solutions based on distributed solar can provide reliable power to these communities, empowering them with access to education, healthcare, and economic opportunities.

While utility-scale solar installations have their advantages, a balanced approach that embraces distributed solar and opens new markets can offer numerous benefits in terms of grid resilience, economic growth, job creation, environmental sustainability, and community empowerment.

CCBJ: When you refer to behind the meter what categories are you talking about, and what dynamics are in play behind the meter and in front of the meter?

Behind the meter refers to any electricity produced on site. In front of the meter refers to the grid side of the electrical meter. It can be in reference to many things: residential solar is typically behind the meter, batteries, etc. Front of the meter would indicate power generation off site brought to the residence. Some apartments or coops do already use solar: however the solar is generated off site and brought to them from the utility. The SolShare is the first behind the meter solution as it allows the property owner to own the assets (solar panels, inverters, etc) and provide solar to multiple tenants. In short, the SolShare enables tenants to directly consume onsite affordable renewable energy.

CCBJ: Solshare seems to have worked out the relationship between landlords and tenants but what is the incentive for landlords to make the investment and what kind of financing can they achieve, particularly in the low income neighborhoods that you advocate broadening access to? Bergsneider: Installing solar energy systems offers cost savings on electricity bills for landlords and tenants, increases property value, fosters a positive public image, and can be financially feasible through tax incentives, rebates, and various financing options like PACE, solar leasing, and green banks. Below are just a few ways building owners can benefit from making the investment into rooftop solar for tenants with the SolShare.

Cost Savings: Installing solar energy systems can lead to significant cost savings on electricity bills for both landlords and tenants. By generating their own clean energy, landlords can lower the operating expenses of their properties for common areas. This can make their rental units more affordable and attractive to tenants, which increases their occapancy rates. Additionally, if rent and utilities are bundled together, the landlord can choose to pocket part or all of the savings from solar energy.

Increased Property Values: Solar installations can increase the value of properties by providing an additional selling point and attracting environmentally conscious tenants. Higher property values can result in better returns on investment for landlords.

Positive Marketing and Public Image: Incorporating solar energy aligns with sustainability goals and demonstrates environmental responsibility. It can enhance the reputation of landlords and attract socially conscious tenants or organizations that value green initiatives.

Tax Incentives and Rebates: Many jurisdictions offer tax incentives, grants, or rebates for solar installations. Landlords can take advantage of these programs to reduce the upfront costs and improve the financial feasibility of their investments.

Financing Options: Landlords in lowincome neighborhoods can explore various financing options to overcome initial investment barriers. These include: • Property Assessed Clean Energy (PACE) Financing: PACE programs allow property owners to finance solar installations through a voluntary property tax assessment. Repayments are made over an extended period, making it accessible to landlords with limited upfront capital.

• Solar Leasing or Power Purchase Agreements (PPAs): These arrangements involve a third-party provider who installs and owns the solar system. Landlords sign a lease or PPA agreement, paying a fixed rate for the electricity generated by the system. This eliminates upfront costs and allows landlords to benefit from solar energy without the burden of ownership.

• Green Banks and Financing Institutions: Some regions have green banks or financing institutions that offer low-interest loans or specialized financing programs for renewable energy projects. Landlords can explore these options to access affordable capital for solar investments.

CCBJ: What are your observations about community solar as a market? Does this mean cities, offices or condominium associations and what kind of financing programs are there to expand this slice of the market?

Bergsneider: While "community solar" and "shared solar" tend to be used interchangeably, "shared solar" is a broader concept that includes various models where multiple participants collectively share the benefits of a solar energy system.

Community solar refers specifically to projects where customers buy or lease a portion of solar panels in an array, receiving electric bill credits for their share of the solar system's electricity generation. Community solar can be helpful to individuals who cannot install rooftop solar panels due to factors like insufficient solar resources or financial constraints. However, there are downsides to community solar, such as the lack of on-site solar generation, limited availability, potential administration costs, absence of government incentives, and the need for 3rd-party coordination, which can drive up project development time and costs.

Shared solar on the other hand encompasses shared ownership of solar arrays and the sharing of direct solar-generated electricity among participants in specific buildings or developments. It allows a wider range of stakeholders to directly access solar power benefits without third-party intervention. Ultimately, this results in the most cost efficient energy generation for residents and best resilience to blackouts.

Allume developed our technology that enables occupants of multifamily units to share onsite rooftop solar. This direct rooftop consumption enables renters and building owners alike to capture the full retail value of electricity, and sell back to the grid when power is in high demand.

Financing is key to accelerating shared rooftop solar. The U.S. Environmental Protection Agency (EPA) has launched three grant competitions under the Greenhouse Gas Reduction Fund, providing a total of \$27 billion in funding. These grant opportunities aim to mobilize private capital into clean technology projects, creating jobs, lowering energy costs, and reducing pollution, with a focus on benefiting lowincome and disadvantaged communities.

The competitions include the \$14 billion National Clean Investment Fund, which will support national clean financing institutions to provide accessible financing for clean technology projects, the \$7 billion Solar for All competition that will fund programs advancing solar adoption in LMI communities, and the \$6 billion Clean Communities Investment Accelerator, which will fund hub nonprofit organizations to assist community lenders in financing clean technology projects in low-income communities.

Through financing with green banks and CDFIs, Allume is broadening our partnership opportunities to be the key solution for multifamily solar installation. There is a lack of awareness and understanding about shared solar within the financing space; hence, it is critical that Allume is at the forefront of many of these discussions in order to advance the environmental goals many of these programs have.

CCBJ: What role does storage play in the installations that you wish to support? And how important is the evolution of battery technology and the reducing of costs to increasing the influence of residential and rental solar?

Bergsneider: Allume is continuing partnerships with battery companies as our business continues to hit commercial scale. Storage plays a crucial role in the growth and support of residential solar installations, as well as rental residential solar platforms and other markets. The evolution of battery technology and the reduction of battery costs are key factors in increasing the influence of these solar systems.

By incorporating energy storage systems, such as batteries, into solar installations with our solar-sharing technology, the overall effectiveness and value of the system are enhanced. The inclusion of a battery with Allume's technology allows solar users to store excess energy generated during the day for use during times of low or no solar generation, such as nighttime or cloudy days. This enables solar system owners to maximize their self-consumption of solar energy and reduce reliance on the grid.

One significant advantage of solar systems the pair Allume's solar-sharing technology and battery storage is their ability to provide power during grid outages. In the event of a power outage, our technology can continue to supply electricity throughout an apartment, ensuring that critical appliances and devices, like air conditioning units or medical equipment, remain operational. This feature greatly enhances the reliability and resilience of the energy supply, reducing the negative impacts of power outages for both homeowners and renters. Moreover, integration of storage with Allume's solar-sharing technology contributes to the stability of the grid. During peak demand periods, when electricity usage is high, stored energy from residential solar systems can be discharged into the grid, reducing strain on the utility infrastructure. This can help mitigate the risk of blackouts or other issues caused by grid overload.

CCBJ: How did you start and finance the company in the first place and what kind of business model pivots have you had to make in the moving trends of renewable energy?

Bergsneider: Cameron Knox is the CEO of Allume and an emerging leader in the global clean technology space. Since co-founding Allume in 2015, he has led Allume as CEO from concept to a company with installations across 5 countries and 38 employees in 3 continents.

Current business model pivots include our current transition moving beyond selling the Solshare to solar installers, to partnering with installers to offer a turnkey installed product for end customers. This has improved install success, created synergies for post-install service, and increased in-

Allume's SolShare Hastens the Arrival of Multi-Family Solar

In May 2023, Allume Energy announced the deployment of its initial U.S. shared solar energy technology and aims to bring its SolShare solution to all apartments, in particular within low-to-moderate income (LMI) communities across the U.S. By allowing multi-family buildings, including renters, to access the benefits of solar energy, Allume's technology could unlock widespread rooftop solar and provide a solution to energy equity.

The number of U.S. homeowners who have installed solar panels has doubled since 2016, and 86% of Americans say they would welcome rooftop solar in their community. This is no surprise given that self-generated solar energy is one of the easiest solutions for standalone homeowners to reduce their energy bills, access renewable energy, and increase resilience to blackouts. Yet apartment owners and renters, who are more likely to be LMI earners, have historically been unable to access solar energy due to financial and technical considerations.

According to National Renewable Energy Lab (NREL), LMI households represent 42% of the U.S. population, and the U.S. Department of Energy notes that "low-income households face an energy burden three times higher than other households." Additionally, NREL states that solar generation can technically meet most electrical consumption

stallation efficiency which has all enhanced customer experience.

CCBJ: What was your original inspiration to get into this business?

Bergsneider: The original inspiration came when deploying dozens of systems on houses at Narromine, an indigenous community in New South Wales, Australia. These were communities that had minimal grid access and faced heavy energy burdens having to pay exorbitant amounts for electricity. When leadership explored the idea of sharing energy and found no existing technology, it sparked the development Allume's behind-the-meter technology.

CCBJ: What direct evidence of climate change have you experienced in your lifetime?

Bergsneider: Direct evidence has included increased occurence of flooding after unusually intense rain seasons, drought and wildfires, which have created days of hazardous air quality levels along with water access strain. Increased concern around grid outtages due to wildfires is especially strong during the hot summer months when not having access to AC can be lifethreatening for many. 🜣 in the U.S. if we include renter-occupied and multi-family housing, given solar penetration and available roof space.

Multi-Tenant Solar Struggles

Imagine a solar panel array on an apartment building roof. The array collects energy and pipes it down the building to an inverter, which then feeds into — what exactly? This is the beginning of the problem. Energy must go into a grid meter, which then provides electricity to an area within the building. The building owner can deliver that energy to a common area (lobby, gym, etc.) and thereby offset the building's energy consumption. This benefits the landlord but does not directly benefit tenants.

Alternatively, the solar energy could be sent to one or more apartment meters, but this introduces other challenges. How should the energy be divided? What if a tenant goes on prolonged vacation or moves out, leaving the space vacant? The results are inefficient at best. Inefficiency (and cost) compounds if the building has multiple solar arrays servicing multiple inverters, each tied to its own meter.

Multi-tenant building solar installations typically fall pretty to the "split-incentive problem," wherein a building owner may pay to install a solar energy system, but tenants would derive the monthly economic benefits of using that solar power. The landlord can charge a fee to tenants and seek to recover the solar costs, but this is often a lengthy, contentious process.

Alternatively, families or landlords can turn to "social" or "community" solar options, in which participants can collectively invest in a shared, off-site solar energy system. Participants typically receive credits on their energy bills for the electricity generated by their portion of the solar array. Social solar projects can benefit the environment and the local community, as they promote clean energy and can create economic opportunities, but they come with key drawbacks. 3rd Quarter 2023

The value of energy produced by a social solar farm depends on several variables, but the paramount concern revolves around how much the local power utility will pay for that energy. (This also applies to "net metering," in which a building could sell some or all of its generated solar energy back to the grid.) Specific numbers can vary widely, but assume that it costs 20 cents per kilowatt-hour (kWh) to consume electricity from the grid. The utility may only pay 7 cents per kWh from private entities for solar power. Regulations and policies may only mandate a "fair rate" for power fed back to the grid. "Fair" is open to interpretation, and broad pricing disparities are common. Thus, the credit offered to social solar participants by the utility may significantly undervalue the actual power generated. For this and other reasons, the rule is that the closer the electricity consumer can be to the point of generation, the better.

The SolShare Business Model

Recall that rooftop solar array, and use the analogy of water, a hose, and buckets. If the energy flowing from that rooftop array is water, and the wiring from the building's inverter to its meters is the hose, and each meter is a bucket, then you can imagine that hose trying to distribute water. The simplest approach would be to spray every bucket at once. As noted above, though, this approach presents many issues and inefficiencies, including an inability to adapt the spray to changing conditions.

Allume's SolShare is installed on the building between the inverter and the grid boxes: think of it as a smart sprinkler. The SolShare sends water to each bucket in turn, moving between the buckets several times per second. In cases when the Sol-Share is configured with limits for each tenant, if one bucket reaches its limit, then the incoming water/energy is allocated to the remaining buckets. Any "overflow" from all buckets being full could be sold back to the utility grid. SolShare's flexible software lets tenants monitor their clean energy use while landlords can set rules for how solar energy should be used in the building. For example, a landlord could allocate 50% of the solar power for common areas (thus reducing the building's energy bill), then share the remaining 50% among tenants (reducing their energy bills). If a tenant moves out, their allocation could be divided among the remaining tenants.

SolShare allows building owners to use solar as a cost-saving incentive for tenants, not just a social incentive, while also using SolShare's software to provide energy use data that can help with ESG reporting. This reporting may be particularly helpful in markets like Los Angeles and New York, where there is increasing demand for buildings with lower carbon footprints. Landlords that install the SolShare can also receive solar investment tax credits. According to Allume, "buildings with lower utility bills have 3% to 7% higher occupancy rates," thereby helping increase the building's asset value.

Aliya Bagewadi, director of US Strategic Partnerships at Allume Energy, says, "Our product is trying to maximize solar consumption within the building. We're not trying to send solar back to the grid in exchange for credits. We're trying to get tenants to consume rooftop solar directly, and that has historically been extremely rare."

Allume was founded in 2015 in Melbourne, Australia, and is expanding into the U.S. and U.K. The company's first U.S. deployments was in 2022 in Orlando, Florida, and, most recently, in Jackson, Mississippi. In its Orlando deployment, SolShare eliminated the equivalent of 1800 pounds of CO2 emissions and saved each building tenant \$242 in electricity per year. SolShare now runs on over 1,500 apartments, with demand growing around the world. 🜣