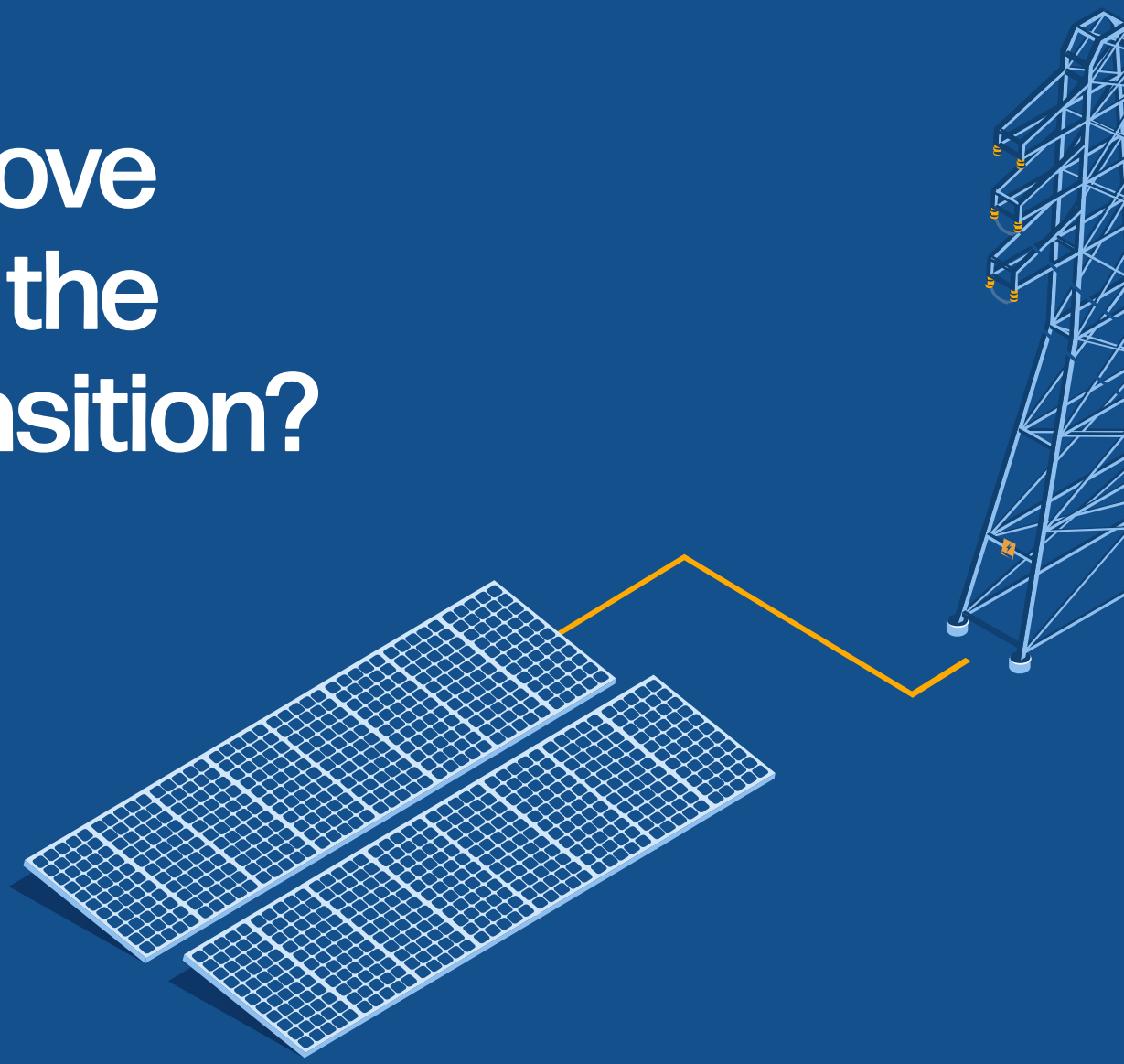
Ebook

How can we improve grid saturation in the clean energy transition?



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Our current situation

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The clean energy transition is an essential global movement towards sustainable power sources, aiming to combat climate change and preserve our planet.

The International Energy Agency has stated that yearly investments in energy sector technologies and infrastructure will need to increase from today's level of over $1 trillion to a staggering $5 trillion by 2030.

This considerable growth demonstrates the urgency of the climate crisis, which demands immediate action from countries worldwide to transition from fossil fuels to clean energy solutions.

Our current situation

The Paris Agreement serves as a reminder of this urgency, stating that "to limit global warming to 1.5°C, greenhouse gas emissions must peak before 2025 at the latest and decline 43% by 2030." This ambitious target reinforces the need for rapid change in how we generate and consume energy.

One notable initiative is the EU Clean Energy Transition. The LIFE Clean Energy Transition sub-program, with a budget of nearly €1 billion over 2021-2027, seeks to facilitate the shift of the EU toward a green, efficient, and resilient economy.

In the United States, the Inflation Reduction Act (IRA) of 2022 is another significant step toward clean energy. This groundbreaking legislation represents the single largest investment in climate and energy in American history. It enables the country to tackle the climate crisis while also advancing environmental justice.

43%

is how much greenhouse gas emissions must decline by 2030 to limit global warming to 1.5°C.

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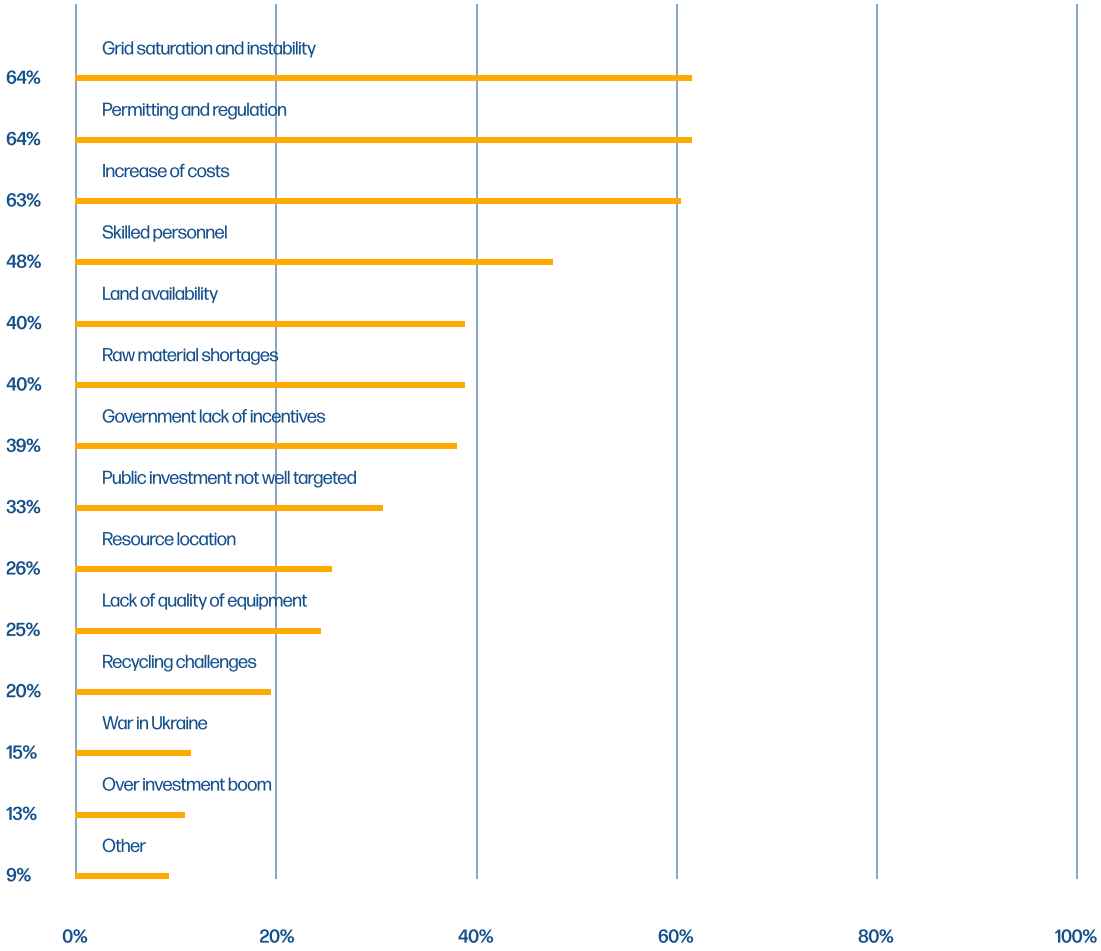
As countries continue to shift towards clean energy, one of the most **significant challenges** that surfaces is **grid saturation.**

According to the Renewable Energy and Solar Research Report, 64% of industry professionals who participated in the survey saw grid saturation and instability as the biggest challenge for the renewable sector.

With more renewable energy sources being integrated into the grid, improving and adapting the existing infrastructure to handle the increased capacity is essential. By focusing on grid saturation, we can ensure a smoother transition to clean energy and optimize the use of renewable resources.

Our current situation

What are the biggest 5 renewable sector challenges for the upcoming year?



Source: Renewable Energy and Solar Research Report

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What is standing in the way of reaching net zero?

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The **primary obstacle** to achieving net-zero emissions is the **slow pace of progress on multiple fronts.** The energy transition will require an enormous increase in capital spending on the electrical grid, and quickly. Along with this, several additional challenges also stand in the way.

2.1 Infraestructure shortcomings

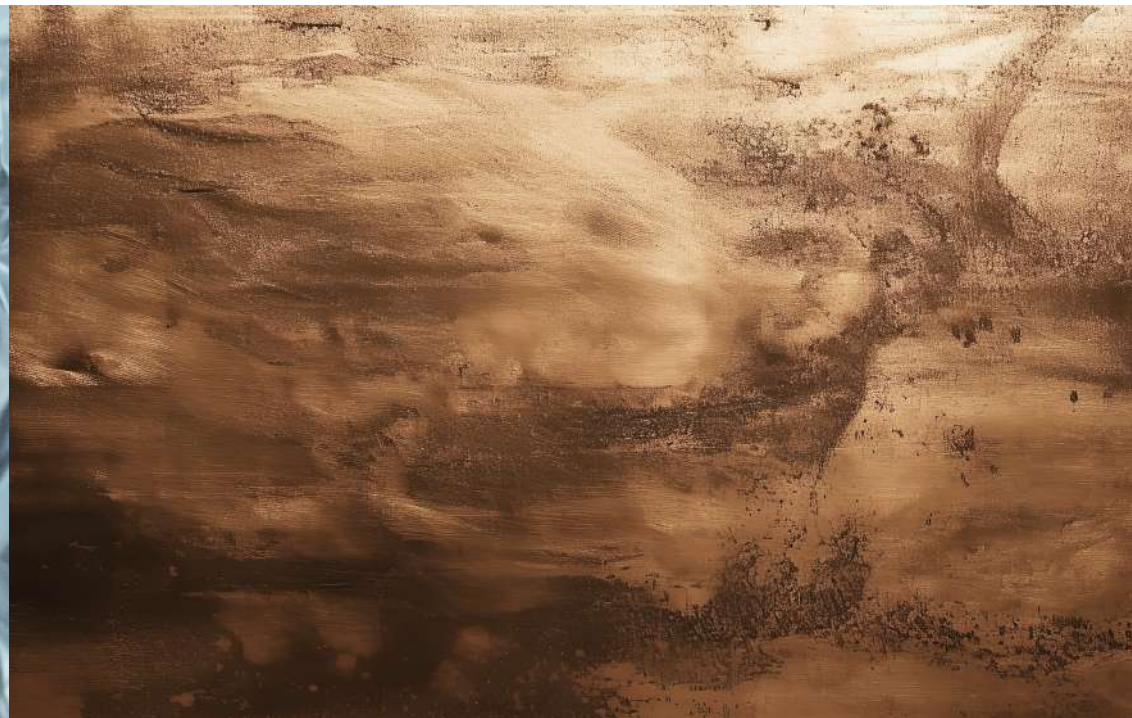
Firstly, **the clean energy transition relies on a completely overhauled and upgraded electrification infrastructure.** The world currently lacks the correct infrastructure and manufacturing capabilities to support the speed at which these need to take place, and the investment required. This deficiency hinders our ability to transition rapidly to renewable energy sources and fully exploit their potential.

What is standing in the way of reaching net zero?

2.2 Raw materials and supply chain concerns

Another significant challenge is securing the raw materials required for renewable energy technologies. These materials include lithium, cobalt, and rare earth elements, which are essential components in the production of batteries, solar panels, and wind turbines. However, obtaining these materials comes with its own set of issues, such as **limited reserves, geopolitical concerns, and environmental impacts.**

When considering upgrading grid capacity, the two primary materials of interest are **aluminum and copper,** both of which are major components of transmission wires and cables.



Aluminium

Aluminum is the third most abundant element found in the Earth's crust and as a result, is **fairly easy to obtain.** This fact, combined with aluminum's **low cost, lightweight nature, and easy recyclability, make it a good choice for rapid, cheap grid expansion.**

Aluminum is used for **overhead cables**. With demands and prices for both copper and aluminum expected to grow over the coming years, the outlook is still uncertain for grid expansion projects.

Copper

Copper has far **better electrical and thermal conductivity** than aluminum and has therefore been the preferred choice for grid installations. The issue is that copper is over **three times heavier than aluminum and less abundant,** making it more costly and harder to work with.

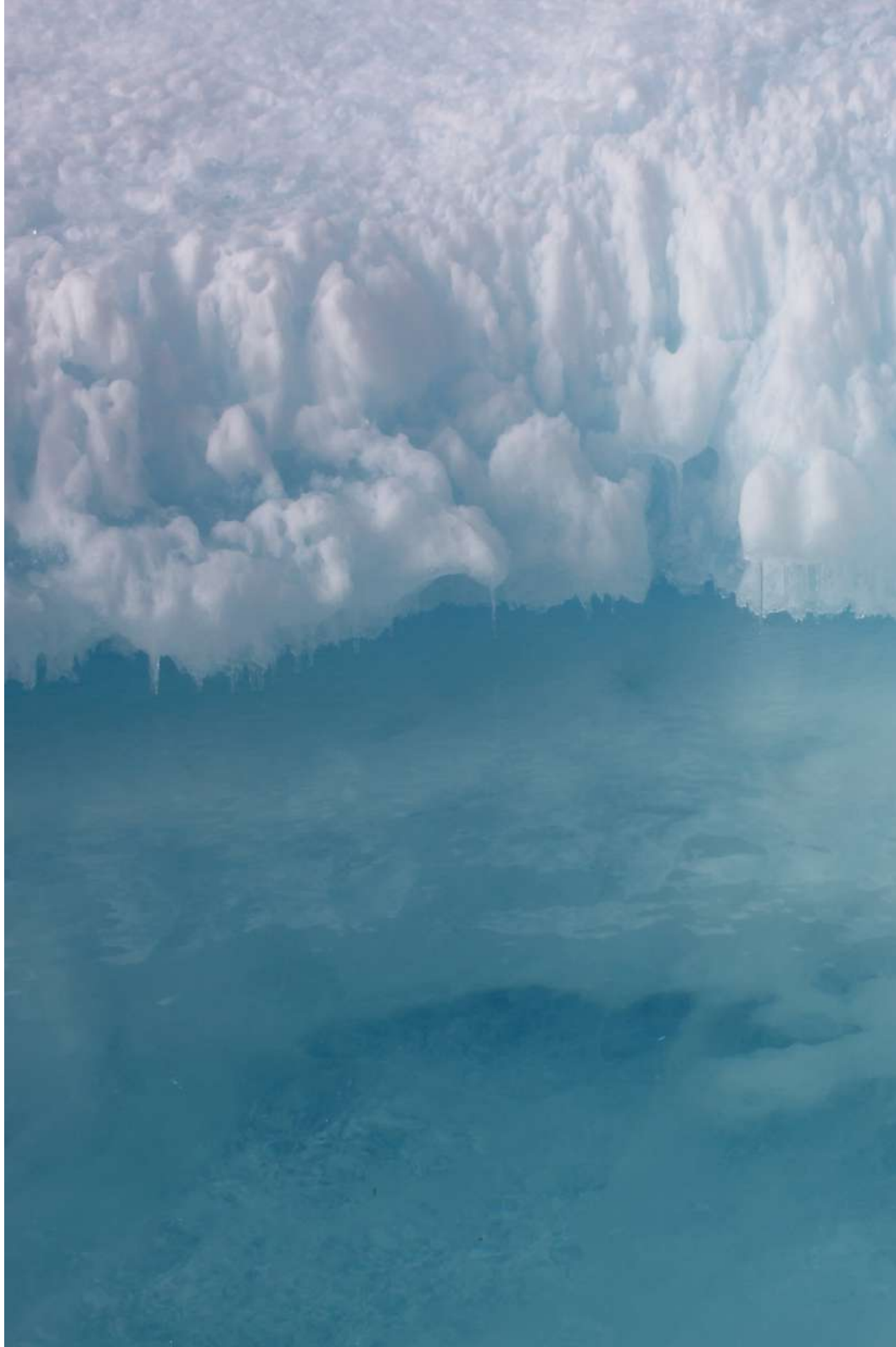
Copper is more frequently used for **undersea cables** where weight is not an issue and its relative robustness as a material helps in the inhospitable environment.

As we continue on this slow path toward clean energy, the risk of causing irreparable environmental damage grows.

Delayed action increases the likelihood of passing crucial points in the climate system, which could lead to further irreversible consequences for ecosystems and human societies.

We have already caused a great deal of damage, which cannot be undone, but it is crucial to change course quickly to prevent further harm and work towards a sustainable, resilient future.

What is standing in the way of reaching net zero?



So, what can be done?

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Several key actions must be taken to improve grid saturation in the clean energy transition, ranging from increased investments to streamlining technology and raising awareness.

Investment

First and foremost, **more investment is needed.** As mentioned earlier, the USA Inflation Reduction Act and the EU Clean Energy Transition are prime examples of significant financial commitments. These investments should serve as a model for other countries to follow suit, enabling the rapid expansion and deployment of clean energy infrastructure.

A serious and immediate commitment is required from both governments and the private sector. Stripping away red tape is crucial, as bureaucratic hurdles often slow down the approval of contracts and permits for renewable infrastructure.

Technological advances

Technological advancements also play a vital role in solving the grid saturation problem. **Breakthroughs in renewable technologies, like Battery Energy Storage Systems (BESS) and more efficient photovoltaic (PV)** modules requiring less surface area to achieve the same output, can enhance the grid's capacity to integrate clean energy.

AI, machine learning, and automation technologies can also help streamline energy management and optimize grid operations. A good example of this is the use of smart meters, allowing grids access to real-time demand data and adjust outputs accordingly.

So, what can be done?

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Education & awareness

Education and awareness is another area that needs attention. People are more likely to invest in clean energy and adopt sustainable practices if they understand the issues and the stakes involved. We can **encourage collective action** by promoting awareness and clearly articulating the challenges and benefits of the clean energy transition.

Dynamic energy pricing is one such example of climate education that is being picked up by various countries around the world. When energy demand is high, prices go up. And in turn, prices drop when demand is low, and there is excess capacity. This leads to an intuitive understanding of grid demand and fluctuating energy production cycles. Initiatives like this are essential for education and helping protect consumers, so much so that some places, like California, are looking to mandate the practice of dynamic energy pricing in law.

So, what can be done?

A robust supply chain

To take a term from the finance world, COVID-19 was a "black swan" event that exposed vulnerabilities in global supply chains and existing infrastructure.

As we emerge from the pandemic, **it's critical to fortify these supply chains, improving their efficiency and resilience, especially given the ever-changing geopolitical landscape.** A robust supply chain is vital for the successful deployment of renewable technologies.

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Available technology to achieve the green energy transition

One other area we must capitalize on is the available technology to achieve the green energy transition. It's important to note that the clean energy transition is not only a necessary response to the climate crisis but also **an opportunity to invest in sustainable infrastructure and technologies.**

We can overcome grid saturation challenges by actively adopting and integrating innovative solutions. Time is of the essence, and we must now streamline our approach.

So, what can be done?

As we work together to improve grid saturation in the clean energy transition, **innovative solutions like those offered by Rated Power, an end-to-end software solution that designs and engineers PV plants** as well as crucial elements such as their substations and overhead lines, will play a pivotal role in ensuring we get there.

Let us walk you through pvDesign

Embracing the potential of clean energy technologies with Rated Power's pvDesign will help optimize and accelerate your solar PV projects today.

Learn more

So, what can be done?

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Crafted solutions for every solar professional

pvDesign automatically generates the best solution for an interconnection facility, choosing between a switching and breaking station, a line to transformer substation, or a single/double busbar substation.

Take steps to determine the best electrical features of a substation and delve into the most essential criteria for solar developers and EPCist by tuning into this Webinar: Substation engineering: A-Z.

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