Author's Note

WHEN THIS BOOK was released in late 2020, I wanted to provide an easy introduction to the unique challenges and opportunities that the global and Indian energy transition presents for us and make otherwise complex issues more accessible to readers. I am delighted to learn that over the last two years the book has become one of Amazon India's best-selling titles. In this new edition of the book, I have revised specific data points that appeared in the original to better reflect how the sector has evolved over the last two years. This edition also includes a chapter on green hydrogen, which is evolving to be the next big opportunity in the energy transition and an important growth driver for my company, ReNew. The book will also be translated into Hindi and Gujarati, making its content more accessible to a larger audience.

I have been active in the renewable energy sector for the last fifteen years. In some ways, that makes me one of the veterans of this relatively young industry. I have seen the development of India's renewable energy industry from an installed base of 15 Gigawatt (GW) to its current 110 GW, and progress on its journey to becoming 500 GW by 2030. While this is a massive increase, behind the numbers lie some incredible changes—in rapidly decreasing costs, improved technology

and sophistication, in the growing demand for electricity and a growing realization that without more renewable energy, we cannot solve the world's climate problem. This problem has become one of the most intractable and significant issues of our time.

The world has changed a lot since this book was published and it is imperative for us to act quickly, and boldly, to keep up. Even with the passage of time—and in today's more volatile and uncertain world—the main messages shared in this book remain true. However, as I started writing this book in 2018, the Covid-19 virus or the war between Russia and Ukraine were unimaginable. This is why there is little reference to the impact of such events on the energy transition or the economy. I am, therefore, using this section to share my thoughts on how the world has changed for this sector, our country and my company over the past two years.

The Covid-19 pandemic has been a crisis unlike any other that we have experienced. The pandemic hit home for many of us as we lost a few members of the ReNew family to it. It stopped economies in their tracks and challenged policymakers like never before. The choice for most countries came down to a trade-off between lives and livelihood, saving people's lives from Covid-19 or putting them in harm's way as far as their economic welfare was concerned. Thankfully, experts have predicted that the worst is behind us and the world is now opening up and getting back to business as usual. Therefore, the short answer to the impact of Covid-19 on the renewable sector is that it has not been negative. The sector has continued to thrive even during this pandemic and the government and private players have continued to innovate and move the ball forward in growing the sector.

Just as the global economy was recovering from the impacts of the Covid-19 pandemic, inflation soared to new heights, and markets have been highly volatile with several central banks frantically raising interest rates to combat high inflation. Russia's invasion of Ukraine has intensified this, and these events leave grave consequences for the global energy sector. The conflict saw oil prices jump to more than $130 per barrel as the war started in February 2022 (double of what it was in early

December 2021). The bitter reality is that fossil fuels will continue to react to troubling world events in a way detrimental to economies around the world and, unfortunately, one can expect more future geopolitical disruptions. The clues to our future lie in our past. The Iraq wars, the 9/11 terror attacks, the 2008 financial meltdown, and the original oil shock of 1973 due to the Arab–Israeli war: all these events created surges in crude oil prices, hurting oil-importing economies. As Asia's third-largest economy and the world's third-biggest oil importer, India has been one of the worst-affected economies by the conflict and has had to turn to deeply discounted Russian oil to cut its imports bill.

High inflation and low employment are typically indicators that we could be slipping into a recession. With inflation rates at an all-time high, if our incomes struggle to support the higher cost of everything, then we get into trouble. What does this mean for India and the clean energy sector? The good news is that the crisis could be a blessing in disguise for the renewable energy sector. Many countries are journeying away from fossil fuels due to the existential threat of climate change. This process has accelerated following the COP26 summit in Glasgow when India set itself an ambitious goal of 500 GW of non-fossil fuel electricity capacity by 2030. The journey is no longer only about just fighting global warming, critical though that is. The Russia–Ukraine conflict has also underscored the criticality to make a shift towards cleaner energy sources for energy security. Renewable energy solutions such as wind, solar and biomass have gained increased interest and investment across the world with volatile oil prices. Energy security is now an important priority and there is a global push to protect economies from the vice-like grip of oil.

Commodity prices have been soaring over the past year or so due to the Covid-19 pandemic, war, and supply chain constraints. This means that solar prices are also rising as a result of elevated solar photovoltaic cell and module prices. So, although renewable energy demand is rising dramatically, supply chain constraints and rising costs are causing supply-side issues for the industry. India's solar and wind installed capacity additions have grown this year but a decline in clean energy financing,

higher equipment prices and rising interest rates are creating challenges for project developers.

The health of India's power sector has been mixed. On the one hand, Indian power demand continues to rise while on the other hand the increases in capacity are dominated by renewables. The increased adoption of electric vehicles coupled with the rapid pace of industrialization and the development of residential sectors will add considerably to the demand for power in the country. India's renewable energy industry has come a long way in a very short time, making it increasingly attractive to overseas investors. Capacity has doubled to 110 GW in just five years and renewable power now comprises 28 per cent of total Indian power capacity, up from 13 per cent in FY16. By 2026-27, our country's power-generation installed capacity is likely to be close to 620 GW, of which 38 per cent will be from coal and 44 per cent from renewable energy sources. Last year, Prime Minister Modi raised the bar with renewed climate targets. These include a pledge to attain a renewable energy capacity of 500 GW by 2030 (from 450 GW) and a net zero target of 2070 for India. India is the only major country to keep to its Paris 2015 climate commitments and I believe that with the government's credible steps and ambitious targets, the health of the renewable energy sector is in good shape. There's a lot to celebrate with progress on the ground—India added 12 GW of renewable capacity in 2021, which was the third largest globally after China and the US. India currently has the lowest levelized cost of energy (LCoE) of renewable power in the world. Well then, what's the problem?

After rapid expansion in capacity over the past decade, the country's energy deficit had fallen to negligible levels—until the last twelve to eighteen months when there were two power crises (August–September 2021 and April–May 2022). The first was caused by increased demand coinciding with a shortage of coal. The second was the result of heatwaves and the return of economic activity after the Covid-19 pandemic, resulting in power pricing reaching an all-time high. This was partly due to the unavailability of coal and a lack of fully operational power plants. India's power crisis is likely to accelerate the adoption of renewables as shortages

make coal-fired electricity more expensive. Wind and solar power—even after import tariffs on cells and modules—are often cheaper than coal power and frequent supply disruptions for coal are expanding the price gap. If India doesn't add renewable capacity fast enough, we're looking at a structural shortfall in power supply. The crisis has brought the spotlight on our country's energy security. To fix the problem, we need sufficient energy to meet our requirements; clean energy to ease global warming, and to enhance the grid network with better storage capacities.

In 2021, my company, ReNew, prepared for a new stage of its growth as we listed on the NASDAQ. It brought me great pride to see the Indian flag with our company's logo in Times Square in New York and to ring the opening bell at NASDAQ standing next to members of the ReNew family who made this journey possible. In many ways, the listing was a culmination of the untiring efforts and commitment of each and every ReNewer over the years and the company-wide celebration with them during our last annual ReNewer's Day will always be a special memory in my mind.

As discussed in the book, we need a healthy and flourishing manufacturing industry for Indian companies to be competitive globally. In line with this, the government launched the Production Linked Incentives Scheme (PLI) with the intent to boost manufacturing and this has been a welcome step that could add $520 billion to the GDP in the next five years. The government's most recent budget has also been climate-friendly—this shows the strong intent of Prime Minister Narendra Modi and Finance Minister Nirmala Sitharaman to move the nation towards clean energy. The announcements include an increase in the PLI scheme outlay for solar manufacturing; a boost to the energy storage ecosystem; the creation of climate financing avenues; welcome power sector reforms; and a continued focus on energy access via decentralized clean energy. As part of our effort to support the Prime Minister's call for an Aatmanirbhar Bharat (self-reliant India), we're proud to announce an investment of ₹2,000 crore to develop a solar cell manufacturing unit of 2,000 MW creating 2,000 direct jobs. Even globally, governments are using economic recovery as an opportunity

to give a green tinge to their fiscal stimulus measures. For example, the Biden-led government recently announced the Inflation Reduction Act, which would be the US's most significant investment in climate change ever—by providing tax credits and investments for energy projects, helping create thousands of new jobs, and helping lower energy costs in the future. Such large-scale measures by governments across the world will provide the much-needed impetus for energy transition.

In addition to keeping existing operations going and infusing liquidity, the Indian government has also come out with very innovative new tenders over the last few years. First, in January 2020 there was a 1,200 MW bid for delivering renewable energy during the day but with a specific requirement during peak time blocks in the morning and evening, with a certain required amount of battery installation. I am happy to say that ReNew will be installing 300 MW in this tender with a utility-scale battery installation of 150 MWh. This will be a first-of-a-kind project in Asia and India's largest battery installation and will allow us to move forward on building an ecosystem in India in this critical area of storage technologies. The second innovative tender by the government in June 2020 was for 400 MW of 'round-the-clock' power in which the generating company has to supply a minimum plant load factor of 80 per cent over the course of the year. Again, I am glad to say that ReNew won the entirety of this tender. It will require us to install significantly more than 1,000 MW of wind and solar capacities along with some amount of batteries to meet the bid's design objectives. Both these bids will significantly move forward on the issue of intermittency management of renewables. As R.K. Singh, minister for power and renewable energy, said at a discussion forum, the intent of the government is to experiment and test out new ideas. He rightly called this discovery process 'an adventure', which it is, and it is terrific to see India taking the lead through such path-breaking initiatives. I am more than pleased that ReNew is taking a leadership role in these critical areas.

The government is toying with other ideas too, such as dedicated solar projects for India being set up in the Middle East and shipping the power back to India through undersea cables, to meet the evening

peak demand in India. Or solar projects being set up in Ladakh with the electricity generated being transmitted over the Himalayas into power-hungry north India. Or vast offshore wind installations off the coast of Gujarat and Tamil Nadu. Or large-scale batteries being installed to manage the grid better. And less fanciful perhaps, but very critical, enabling the development of a large domestic manufacturing ecosystem for the entire value chain of solar and batteries. And using this to supply to the home markets of course, but also for exports. Even on the distribution side, the government is planning laws that would boost competition and lower debt of its power distribution companies. In addition, the corporate PPA market is growing significantly.

I foresee three trends in India's renewable energy sector in the next three to five years. One, India will start emerging as a supplier and exporter to the world. With the performance linked incentives and other such incentives being provided by the government, the manufacturing ecosystem is improving and we are likely to see India produce components for solar power, batteries, electric vehicles, green hydrogen, among others. This, along with the global move to diversify supply chains is likely to create significant opportunities for India to export to the rest of the world, along with meeting our own requirements. Two, we will see renewable energy increasingly being offered 'round-the-clock', and that will drive its increased adoption by consumers. This will be enabled by storage solutions using either batteries or other mechanisms. Three, green hydrogen will emerge as an important instrument to decarbonize broader parts of the energy value chain, including in the corporate sector. A number of companies in the renewable power sector are likely to set up pilot scale plants in both India and other countries and will focus on achieving economies of scale through larger installations.

As mentioned earlier, this edition includes a new chapter talking about the green hydrogen sector. Green hydrogen is fast emerging as a solution to decarbonize other energy uses like industry and transport. It is also an essential requirement for India as a country since we import a tremendous amount of fossil fuels—almost $150 billion worth every year and that number is increasing and will double over the next seven to ten years. Green

hydrogen is a way for India to find some degree of independence from fossil fuels by replacing the feedstock—which is very often LNG—with hydrogen that can be produced within the country using renewable energy. At ReNew, we are looking at this space closely and have major plans to grow. The government has recently announced a National Hydrogen Mission with an allocation of close to ₹20,000 crore to encourage the uptake of green hydrogen in the Indian economy and for exports.

I am hopeful that as the geopolitical tensions across the world begin to weaken and the Covid-19 pandemic passes, renewables will continue their onward march to making the country self-sufficient or 'atmanirbhar' in power. I am convinced that ten years down the road, Indian companies will be amongst the biggest and most advanced in the world, as will the renewables sector in the country. Globally, too, renewables have done well during the pandemic. If we look at asset markets, both in the equity and fixed income sectors, renewable energy players have bounced back very rapidly from the sharp pandemic-inspired downturns. Stocks such as Ørsted and Tesla went on to trade at all-time highs. More ESG funds are being invested into the sector as investors wise up to the new reality of the energy transition. In fact, the Tesla market cap is now more than that of Daimler, BMW, Nissan, Ford and GM—combined! It has also crossed that of Exxon, which at one time, was the company with the highest market cap in the world. Of course, Tesla is an extreme example of the market interest in ESG stocks, but the reality is that the world is willing to back the green transition with funds in recognition of the growth outlook.

The future for the energy transition is looking brighter than ever before. I hope that as you delve into the history of previous energy transitions, get to grips with the climate change imperative and see some of the changes in this space, you will at least be educated, and possibly inspired!

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New Delhi
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