

# INNOVATING ENERGY

Need for low-carbon and cost-effective industrial solutions for the country

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**Animesh Mishra**  
Head (Sales and PR),  
Energy Efficiency Services Limited



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**Steven Fawkes**  
Managing Partner,  
Energy Pro Ltd.



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**Mahua Acharya**  
MD & CEO,  
Convergence Energy Services Limited (CESL)



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**Soumya Prasad Garnaik**  
Executive Director (Lighting),  
Energy Efficiency Services Limited



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collaborative efforts to develop and implement  
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**Nishant Tiwary**  
IPS  
Officer on Special Duty (OSD) to the Union  
Minister Power, New & Renewable Energy  
Government of India

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**Animesh Mishra**  
Head (Sales and PR),  
Energy Efficiency Services Limited

## Editor's Note

Dear Reader,

Mitigating climate change while continuing to drive economic growth is a big challenge for any country – even the most advanced – but few will have it bigger or tougher than India. We are likely to become the world's most populous country before the end of this decade. Moreover, we are faced with the mammoth task of lifting millions of people out of poverty while we continue to strengthen our capabilities in areas such as technology, services, manufacturing, and renewable energy. All of this will entail significantly more energy consumption than at present and, unless proper steps are taken, a rise in the very emissions that we are trying to limit.

India, as we know, has committed to ensuring 40 percent of its power-generation capacity from non-fossil fuel sources by the year 2030, and to reducing its emissions intensity by at least one-third as compared to the levels in 2005. Emissions have dropped significantly since the middle of last year on account of the pandemic-induced slump but are expected to increase rapidly once industrial and human activities resume at pre-pandemic levels. As one of the biggest economies of the world, how India generates and utilizes energy for its developmental needs will have significant global ramifications.

India is today the world's third-largest emitter of carbon dioxide, behind China and the US. The challenge before us is to make huge developmental leaps without letting our carbon footprint make irreversible dents in the world's efforts to mitigate climate change – something that no country in known history has managed to do yet. Even China's spectacular rise came with a staggering increase in its carbon emissions.

On the positive side, India is acknowledged by multiple climate research organizations as the only major economy where the actions to combat emissions are compatible with the goal of limiting global warming to under 2 degrees Celsius. More importantly, there are nationwide initiatives underway in several important areas such as developing renewable energy and energy storage; using low-carbon energy sources; reducing carbon dioxide emissions from industries; smart metering; convergence of sectors and capabilities; district cooling; energy efficiency; electric mobility, and more. All such efforts need to be supported and ramped up with the help of financial investments and technology advancements.

If we manage to overcome achieve our developmental and environmental goals in parallel – and we certainly have the capabilities to do that – it will be a worthy blueprint for the rest of the world to follow.



**Steven Fawkes**  
Managing Partner,  
Energy Pro Ltd.

## Promising pathways to a low-carbon economy

### Introduction:

We have to move rapidly towards a global low carbon and climate resilient economy and the number of net zero pledges made by nations and organisations across the world reflects a growing commitment to action. There has been a clear shift towards the idea of a green recovery, in which a large proportion of recovery funds are used to accelerate the shift from fossil fuel based energy sources. Although there is still some debate and resistance from incumbents it is now clear that low carbon energy sources are set to form the largest chunk of the future energy mix, supported by an increasing amount of energy storage and a ramp up of energy efficiency initiatives. They will also be the driving forces behind the formation of low carbon economies, across the world.

There has been major shift towards renewable sources of electricity including wind, solar PV, and hydro power. After overtaking coal for the first time ever in 2019, low-carbon sources are extended their lead in 2020 to reach 40% of global electricity generation – 6 percentage points ahead of coal. Renewable energy has really come into its own in the last few years, with more and more nations waking up to the advantages it offers. Apart from being a key tool in restoring and preserving global ecosystems, and reversing climate change deterioration, renewable energy also make considerable economic sense. Solar is now the cheapest form of electricity in many markets. An IRENA report says that doubling the share of renewables in the energy mix by 2030 would increase global GDP by up to 1.1 percent, improve welfare by up to 3.7 percent and support over 24 million jobs in the sector.

However, renewable energy, by its nature is intermittent. This intermittent acts as a restraint for the unfettered growth of renewable energy. Those shackles though have now largely come off, driven chiefly by the emergence of battery storage, which can be used to balance the grid. Battery storage has been around for a while, but suffered from steep costs barriers. However, now, with the falling prices for battery storage components, it has become a viable avenue for maintaining energy continuity and balancing the grid. Battery storage has a major role to play in making the shift to renewable energy seamless and swift. Other large scale storage technologies such as Compressed Air Energy Storage and Cryogenic Energy Storage are also now viable and can offer large scale solutions.

Energy efficiency is an important, and still relatively neglected, instrument for achieving climate and economic goals, across the world. According to the IEA, energy efficiency can contribute up to 49% of the energy-related CO<sub>2</sub> emission reductions that are needed to limit global temperature increases over the next several decades. Although energy efficiency has in fact produced much of the economic and environmental gains of the last three to four decades it is still largely unseen and under-appreciated. It has been estimated that industries have the technical potential to decrease their energy intensity and emissions by up to 26 per cent and 32 per cent providing a striking 8 per cent and 12.4 per cent reduction in total global energy use and CO<sub>2</sub> emission. Energy efficiency, apart from its environmental impact and energy savings, improves the economic competitiveness of countries and businesses, makes energy more

affordable for consumers – and, of course, reduces greenhouse gas emissions. It can also bring with it many non-energy benefits such as higher staff satisfaction, better health, reduced business risks. These non-energy benefits need to be stressed more in the business cases for energy efficiency. We now need to scale up investment into energy efficiency and truly implement the concept of ‘efficiency first’.

The shift to a low carbon future economy is based on the trifecta of renewable energy, energy storage and energy efficiency. These three forces will fashion a sustainable and energy secure future for all of us.



**Mahua Acharya**  
MD & CEO,  
Convergence Energy Services Limited (CESL)

## Accelerating energy transition is the key to enabling a low-carbon economy

Conversations about economic development and GDP growth are almost meaningless today unless they include plans for reducing carbon dioxide emissions and preventing climate change. This is because climate change presents a very real and serious threat to the survival of the human race. Preventing it will require us to bring emissions from industrial, economic, and human activity under a far greater degree of control than we have now. The nations of the world have united, over the past decade, in making time-bound commitments towards reducing their respective carbon footprints. The power sector is one of the most important sectors for any nation's sustenance and development. It is, unfortunately, also one of the most environmentally detrimental ones. Three important aspects of energy – generation, distribution, and usage – therefore need to be addressed in parallel as we transition to a low-carbon economy. There are several ways in this can be done, many of which are already being implemented.

### Smart metering of power

India is making good progress towards the targets it has set itself in terms of renewable-based energy (RE) generation capacity. India has also accomplished its stated goal of connecting every village to the electric grid. The country, however, continues to suffer from the long-standing issue of transmission and distribution losses, which are more than twice as high as the global average. The additional electricity that is generated to compensate for these losses results in "compensatory emissions". These power losses and compensatory emissions can be significantly reduced by integrating more RE and energy storage solutions into the power mix and by digitalizing the power grids as well as the operations of distribution companies.

With the introduction of Advanced Metering Infrastructure and a renewed focus on the Smart Meter National Programme (SMNP), efforts are underway to implement systemic efficiency improvement initiatives for a robust, reliable power grid. The Government estimates that as many as 250 million consumers could adopt paid smart meters in the next three years. More than 15 lakh smart meters have already been installed across the country under SMNP. As we move forward, we will witness greater integration of digital innovation into the energy systems, creating a smarter and more flexible grid.

### Convergence of energy technologies and capabilities

The Convergence initiative is an attempt to bring together seemingly independent sectors such as renewable energy and energy storage to improve energy efficiency and usage in street lighting, domestic lighting, cooking, and e-mobility. This has potential to create new value streams for consumers and to benefit distribution companies, private developers, the state exchequer, as well as the environment. Convergence will not only reduce emissions and avoid peak demand, but also create significant social impact and transformation, especially in rural areas, through reliable and affordable energy access, improved lighting, and better standards of living.

CESL aims to leverage decentralized solar energy and battery storage to address the needs of underserved rural communities in India. These decentralized solutions will power rural

enterprises, agricultural pumps, street lighting, domestic lighting, and cooking appliances. The initiative also aims to assist in the development of viable business models and robust ecosystems for electric mobility and infrastructure in India – an important element of India's plans to reduce vehicular tailpipe emissions.

### **Measures for greater energy efficiency**

Energy efficiency is yet another important aspect of the transition to a low-carbon economy. The use of energy-efficient appliances and systems reduces the consumption of electricity, which, in turn, benefits the environment by reducing carbon dioxide emissions. For example, the RAISE programme, is enabling the retrofitting of air-conditioning systems in buildings across the country so as to improve ventilation, filtration and indoor air quality; enhance energy efficiency; and lower carbon dioxide levels.

The Ministry of Power, through the Bureau of Energy Efficiency, has also launched several energy efficiency initiatives such as standards and labelling for cooling equipment and appliances, and minimum requirements for energy-efficient design and construction of commercial and residential buildings.

There is immense latent demand in India for sustainable cooling solutions. If addressed properly, it can trigger a virtuous cycle. Then, even if India's cooling demands increase with time, reduction in cooling-related emissions will ensure that there is no adverse impact on the climate. District cooling can help in this respect, extensively mitigating the impact of new development on climate change through higher energy efficiency and by reducing carbon dioxide emissions by as much as 30-35 percent.

The tailwinds that drove India's energy sector in the past have changed radically in recent years. The ever-sharpening focus on climate change and carbon footprint have put India's energy transition plans in the fast lane.





**Soumya Prasad Garnaik**  
Executive Director (Lighting),  
Energy Efficiency Services Limited

## A multi-pronged approach to reducing Industrial CO<sub>2</sub> emissions

As per the Intended Nationally Determined Contribution under the Paris Climate Change Accord, India has pledged to reduce the emissions intensity of its GDP by 33% by 2030, as compared to the level in 2005. Although emissions would have dropped significantly in 2020 as a result of the Covid-induced nationwide lockdown, economic recovery in 2021 and beyond could lead to an increase in emissions yet again.

Industry is the backbone of our growing economy - at the same time, it also poses a significant threat to our environment, in terms of GHG emissions (particularly CO<sub>2</sub>) through various industrial processes. As per the UNNATEE document of BEE, the industrial sector continues to be the highest consumer of primary energy, with a share of around 58%. Industrial energy demand has almost doubled over the last 15 years, with large expansion in energy-intensive sectors and this trend will continue even in business-as-usual (BAU) scenario. So, we can easily imagine the continued impact on our environment. There is a need for faster industrial growth as well as mitigation of harmful CO<sub>2</sub> emissions. A multi-pronged approach must be adopted in a time bound manner.

Firstly, the reduction of specific energy consumption (SEC) of major industrial sectors including SMEs would be the key to achieving this goal and energy efficiency (EE) is the only lever in this regard. It is estimated that 185 MtCO<sub>2</sub> of emission reduction per year would be possible by 2030 through EE measures. BEE's Perform, Achieve & Trade (PAT) scheme for 11 energy intensive industrial sectors must be complimented in this effort, as it has resulted in the reduction of more than 40 MtCO<sub>2</sub> per year. Such regulations and market-based mechanism must be widened to industrial sectors.

Secondly, as per a popular saying in energy management "*you can't control if you don't measure*" - data and information would play an important role. There is a need for a robust mechanism to measure and monitor the energy usage at macro and micro level of our industrial operations. We must use data analytic and IoT based measurements for faster, effective and accurate energy management. Also, we must not forget to leverage the services of over 25,000 cadre of energy professionals (energy managers & energy auditors) of the country.

Thirdly, energy efficiency must be widely recognised and acknowledged as a "Service", especially as the ESCO market develops. EESL's efforts as an ESCO in the non-industrial sectors have been phenomenal, however these need to be intensified and propagated to hard-core energy efficiency projects in industries. In a moderate scenario, there is an investment potential to the tune of \$75 billion by 2030, which the ESCO market may target. An institutional mechanism to manage and promote ESCOs in the country may be a good option to bring technology, investment and energy professionals to a common platform.

Next, industries do need next generation equipment and processes to reduce the CO<sub>2</sub> emission, hence "*innovation*" is one of the key strategies to adopt. Focussed R&D should be taken up by Government and Private entities to incubate low-cost, indigenous energy efficient technologies. Institutes of repute like CSIR, IITs and other research set-ups should be engaged with dedicated resources and budget to achieve the set goal.

There may be many more approaches to achieve reduction in CO<sub>2</sub> emission in industrial sectors. Undoubtedly, India will need to strongly promote and rigorously implement its many climate-centric programmes concurrently to ensure that it reduces its environmental footprint as it marches towards progress.



## Nishant Tiwary

IPS

Officer on Special Duty (OSD) to the Union Minister  
Power, New & Renewable Energy  
Government of India

### **As we try to mitigate climate change, we need collaborative efforts to develop and implement low-carbon solutions for our industries**

The rise in industrial activities worldwide over the decades has contributed to a corresponding rise in carbon dioxide emissions, which are currently at their highest level in hundreds of thousands of years. The change in global climate is causing far more frequent occurrences of natural disasters such as floods, cyclones, heat waves, and famine in different parts of the world. Clearly, climate change will have serious socio-economic ramifications unless we take immediate, concrete steps to mitigate it. The United Nations has repeatedly stressed the need for transitioning to a climate-neutral economy.

As we try and lower emissions from carbon-intensive industries and sectors, we need to relook at our developmental strategies to ensure sustainable, climate-friendly economic growth. Such efforts should be in accordance with the tenets of the Paris Agreement, which aims to keep global temperature within 1.5°C from the current levels, and not allow it to rise by more 2°C, at worst. In India, these targets are placed within the broader context of the National Action Plan on Climate Change and are factored into policies such as the National Solar Mission and the Green India Mission.

In recent years, India's industries have made significant progress in reducing energy consumption and emissions by improving the energy efficiency of key industrial processes. However, more deep-reaching changes are needed if we are to achieve and maintain sustainable, low-carbon growth in future decades. Some industries – such as iron and steel, cement, petrochemicals, bricks, aluminium, and fertilisers – are harder to de-carbonize than others owing to the nature of the processes they entail. Nevertheless, their emissions can be reduced significantly by increasing the levels of energy efficiency, circularity, demand reduction, and deployment of de-carbonization technologies.

India's transition to a low-carbon economy has many moving parts, and there are many challenges that need to be overcome in the power sector too. These include the financing of renewable-energy projects, the inefficiencies in the coal sector, and the incorporation of alternative fuel sources. Clean energy projects will need to be complemented by hydrogen and fuel cell technology, carbon-capture solutions, and battery storage. The net-zero goal is, without doubt, a daunting one but can certainly be achieved by transforming our energy systems through the collaborative efforts of the Government, the private sector, financial investors, and technology providers.



# Top energy trends from India & across the globe

- **Global Zero Carbon Buildings Accelerator wants to remove carbon emissions from buildings by 2050**

World Resources Institute (WRI), with support from the Global Environment Facility, UN Environment Programme and World Green Building Council, among others, launched the Zero Carbon Building Accelerator (ZCBA) to speed up the transition to zero-carbon, efficient buildings. The new Zero Carbon Building Accelerator will coordinate the development of national roadmaps and action plans toward a zero-carbon building sector by 2050, beginning in partner countries Colombia and Turkey and eventually spreading throughout the expansive network of subnational partners to the Building Efficiency Accelerator.

- **Majority of New Renewables Undercut Cheapest Fossil Fuel on Cost**

The share of renewable energy that achieved lower costs than the most competitive fossil fuel option doubled in 2020, a new report by the International Renewable Energy Agency (IRENA) shows 162 gigawatts (GW) of total renewable power generation added last year had lower costs than the cheapest new fossil fuel option. The Renewable Power Generation Costs in 2020 report shows that costs for renewable technologies continued to fall significantly year-on-year. With costs at low levels, renewables increasingly undercut existing coal's operational costs too. Low-cost renewables give developed and developing countries a strong business case to power past coal in pursuit of a net-zero economy. Just 2020's new renewable project additions will save emerging economies up to USD 156 billion over their lifespan.

- **Climate Change Committee reports: energy sector praises 'spot on' recommendations**

The Climate Change Committee (CCC) have released two progress reports, highlighting the gap between climate targets and policy. The report on "Progress in reducing emissions - 2021" flagged the relative success of the energy sector's decarbonisation, and report "Progress in adapting to climate change - 2021" stated the sector had made advances in preparing for increasingly extreme weather events. But despite the progress, there are still policy gaps, in particular in areas like low-carbon heating and electrification of transport.

- **EU initiative launches green energy transition in Bangladesh**

European team Initiative—a joint collaboration of the states under EU, like-minded European countries and financial institutions—launched its Green Energy Transition (GET) programme in Bangladesh. The GET initiative with a commitment of more than € 930 million investment, aims to build a power system that will lead to maximum share of the country's energy demand through renewable energy while reducing greenhouse gas emissions, energy consumption and demand through energy efficiency in Bangladesh.

- **Decarbonizing heavy industry in India: what will it take to bring down emissions in the climate decade**

The most critical moments of the decade, UN Climate Change Conference 2021 (COP26), the call for stronger climate commitments by businesses and governments across the globe is getting stronger. The upcoming COP26 will help us define our pathways towards achieving Paris goals and uniting leaders and decision-makers to tackle climate change. Therefore, the actions that have taken till November 2021 are equally critical to strengthening the global momentum towards more substantial commitments by nations to achieve the Paris agreement goals.

India has shown phenomenal success in scaling up solar and wind energy and promoting energy efficiency in commercial and industrial segments in the past few decades. However, a lot to be done in the sectors such as iron & steel, chemicals, cement, etc., in bringing down emission levels and pollution in India. To address this, India must accelerate incorporating clean energy alternatives, transformative technologies, and sustainable production models to ensure just, economic and sustainable growth.