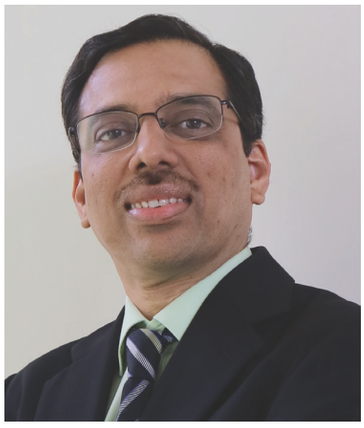
"India can leapfrog into a sustainable future, but we must act now"



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Rapid acceleration of global decarbonisation efforts has presented an unprecedented opportunity for Indian Energy and Power Companies to expand the business into new avenues. ***Venkatesh R, Managing Director & Director Energy Business, Wartsila, India*** *points out flexibility through energy storage is the key to achieve the cost-optimal renewable baseload system to shift excess power to times of deficit in availability. He discusses the challenges to create net zero power systems& shares insights into some of the novel pathways & technologies to decarbonize.*

What would be the best suited pathway for the Indian energy sector to accomplish their share of India's 2070 Carbon Neutrality goals?

India has set a target of installing a non-fossil energy capacity of 500 GW by 2030. The rapid acceleration of global decarbonisation efforts has presented an unprecedented opportunity for Indian Energy and Power companies to expand the business into new avenues, experiment with emerging fuel sources, and prioritise sector-specific innovations in technology and lifecycle solutions. Wartsila Energy has conducted power system modelling that provides a clear roadmap for decarbonisation and reaching net zero power systems by:

- Adding renewables
- Adding flexibility through balancing engines and energy storage

- Phasing out inflexible fossil fuel plants such as coal and CCGT's
- Converting balancing engines to run on sustainable fuels
- Phasing out fossil fuels

Flexibility through energy storage is the key to achieve the cost-optimal renewable baseload system to shift excess power to times when renewables are not available, during evening or night-time. Balancing engine power plants must also be deployed to manage sudden surges in demand or drops in renewable generation. India certainly has challenges ahead in reconfiguring its power system for net zero, however it is possible with technologies that are already available at scale. With the right vision and planning, India can leapfrog into a sustainable future, but we must act now.

What are the key challenges that will be materializing in Indian context with increased up-take of renewables in the primary power mix?

The pandemic has changed the world to adapt to new methods at a rapid pace. Business processes have undergone a paradigm shift from their traditional mould to a digital landscape. Several sectors have shifted to work-from-home options in order to create a safe environment. Customer requirements to continue to run the power plants safely and smoothly even during the toughest of times has become much more essential.

We have seen that our customers' businesses have been impacted by the pandemic. However, recent economic indicators of the country suggest a revival is already underway. The two main challenges we see facing the Indian power sector are fuel security concerns and financial health of distribution companies (DISCOMS).

As an organisation, we have a very robust strategy and vision that will prevail even after the pandemic and in the future: we will continue leading the way towards a 100% renewable energy future. We see that the energy transition gives us an enormous opportunity, and with our flexible technologies comprising balancing gas engines, energy storage and energy management systems, we see a great potential for growth. We will continue working closely with our customers every step of the way, helping them find their optimal path towards renewable energy systems.

In fact, the pandemic has actually sped up the transition towards green energy. What we have seen in developed countries is that the generation of electricity overall went down, and the share of renewables increased.

What are some of the novel technologies required for enabling a sustainable energy transition journey?

The emergence of renewable energy has revolutionised world markets, and renewables-driven change continues with unprecedented speed. Even several years ago, few would have guessed the scope of the new technologies that have been developed to help countries begin the process of decarbonising their economies. Here's a look at five of the most important trends and technologies in renewable energy — some have radically re-shaped the energy market over the last decade, while others are set to make waves in the years to come.

Wind and solar: It is wind turbines and solar panels that represent, for most people, the onward march of renewable energy. Renewable energy is expected to make up 30 percent of the world's energy by 2024, according to the International Energy Agency, and most of this is driven by solar and wind projects that continue to be rolled out at a startling pace. This is a growth in the use of solar panels, which made up 60 percent of the renewable energy capacity installed in 2019.

Electrification: There will be new uses for electricity, including the production of hydrogen from water via electrolysis, recycling carbon dioxide by capturing it from the air, while nitrogen for fertilisers will also be made by taking it from the air. Eventually, electricity demand could increase as much as 3-4 times and the price will fall (thanks to the boom in renewable power). Switching to electricity is key to achieving the decarbonisation of economies, but there are other, less obvious, knock-on benefits including improved energy security (independence from fossil fuel exporters) and better urban air quality.

Power-to-X: Power-to-X is an umbrella term that covers different processes that turn electricity into heat, hydrogen, or renewable synthetic fuels. It offers a significant opportunity to speed up the shift to renewables by ramping up synthetic fuel production, and rapidly reducing fossil fuel emissions in sectors ranging from the steel industry and food production to the chemical industry and fertilisers. Technology can also play a key role in solving long-term energy storage challenges, regulating the ups and downs in supply from renewable sources.

Distributed Generation: A quiet revolution in the field of renewables is the increasing affordability and popularity of distributed generation. This means local power generation either in the retail or commercial sector: from solar panels on private homes to factories using combined heat and power systems. There are numerous advantages to the scaling up of distributed generation, from reducing reliance on centralised power sources to increasing grid reliability and making small-scale renewable power sources viable. When combined with smart grids, which are regulated by computers to fine-tune transmission, distributed generation is even more effective.

Energy storage: The potential of energy storage to accelerate the shift to renewables seems to be key in the years to come. Energy storage will be needed in the power system due to variable wind and solar production. There are multiple energy storage technologies. Some of the solutions that are likely to expand in the coming years include hydro-reservoirs, batteries, Power-to-X fuels, and seasonal thermal energy storage. These same technologies will also be useful for countries with large nuclear power industries. Above all, energy storage allows an efficient flow of power to be maintained despite the intermittent nature of wind or solar sources.

How would AI & ML based data driven modelling tools assist towards real-time decision making in the energy transition journey?

Innovative AI technology is transforming how energy is produced, stored, distributed, and consumed.

Machine learning is the process when a computer system uses data to progressively improve the performance of a specific task and thereby become 'intelligent.' Then, actions can be automated based on certain conditions or pattern recognition which can also anticipate future conditions. The energy industry uses this technology in a variety of applications, such as optimising production in oil and gas fields, generating compliance reports, and making predictions.

Renewable energy is becoming more important, but calm and cloudy days mean less solar and wind energy is generated. Machine learning helps predict more accurately and manage fluctuations in demand and supply, making the whole power system more efficient. It is also being used to lower energy consumption. Both AI and ML will be key elements for the design of future energy systems, supporting the growth of smart grids and improving the efficiency of power generation, along with the interaction among electricity customers and utilities.

Some of the future proof- agile & adaptable energy technologies that are in the development pipeline of Wartsila Corporation which can be deployed in Indian Energy Transition?

Wartsila's strategy is to introduce solutions which are compatible with all types of future fuels. We recently inaugurated our Sustainable Technology Hub (STH), which incorporates under one roof, the R&D, the Testing and Production of the new generation of engines. We design and build our engines to be flexible and future-proof to be capable of running on future fuel. The facility is in the process of experimenting with several emerging future fuels like ammonia, blended hydrogen, green hydrogen, methanol and more. We have seen significant breakthroughs.

Wartsila is focused on developing hydrogen power plant solutions, by having an engine and plant concept for pure hydrogen operation ready by 2025. In October 2022, we completed the tests for Wartsila's engine that has proven that it is capable of continuously supplying power to the grid at engine loads in excess of 95% using hydrogen fuel blend. This was a landmark achievement.

We are exploring the potential of this technology as we focus on providing customers with affordable, reliable, and clean energy. With the expansion of sustainable fuels, Wartsila is targeting to become carbon neutral in its own operations by 2030.

From the global experience of Wartsila Corporation, what are the key insights that you would like to share with Indian Energy sector?

In the current scenario renewables are challenging thermal. The Indian government has ambitious targets for renewables. Coal usage will be reduced in times to come but some coal capacity will remain in the power system as solar, and wind cannot be available all the time. More focus is required on renewables, a clear policy on batteries for Renewable Energy with the exception for solar energy. Earlier, there were power shortages, but now that India has achieved near adequacy, there is a need to focus on reliable power. Battery manufacturing will play a crucial role going ahead.

We are in discussion with various States, utilities, and regulators regarding the role that renewables can play in meeting future electricity needs and strategies to efficiently integrate renewables in the grid. The industry should holistically look at the net cost of the power system and not just at the variable cost.

Wartsila continues to lead the way towards a 100% renewable energy future. Each country, city and company have their own transition path, and we are working together with our partners to create fact-based proposals that utilities and customers can benefit from and use in their own transition planning.

What are the future plans- investments, projects, expansion of portfolio of Wartsila Corporation in India?

It is important to actively invest in flexible capacity such as balancing power plants and battery energy storage to utilise all the power generated from wind and solar power sources and avoid curtailment. Investing in renewables as stand-alone resources is not the right way to go, rather, investing in both renewables and flexible solutions will be the way forward. There is a need to take a holistic view of decarbonising the power systems and create an optimal path to make it happen. Wartsila will continue investing in solutions that are future-proof, taking us closer to a renewable energy future.

Our multi-product state-of-the-art factory at Khopoli, Maharashtra, manufactures auxiliaries' modules and reconditions and upgrades engines, ship propellers and components. We will be looking at how to utilise the factory for enhancing our business in line with Make in India and make Wartsila more competitive. We are looking at how we can indigenise more, with high quality products. That is a part of the strategy.

Wartsila has already delivered around 250 power plants to India with total output of over 3,500 MW. We take care of the operation and management on behalf of our customers in over 35 power plants with a total output of over 1,300 MW in India. Amongst the projects underway, there are couple of them in North-East India, which are significant. We have supplied a 70 MW Power plant to Assam Power Generation Corporation Ltd. This includes seven Wartsila 34SG engines running on natural gas.

Another one is our recent 30 MW engine power plant for Oil India, a premier Indian National Oil Company, which will be delivered under a full engineering, procurement, and construction contract. We won this project through the International Competitive Bidding Process.

Globally, our track record comprises 74 GW of power plant capacity and more than 80 energy storage systems delivered to 180 countries around the world. ■