COP21: The World comes together to fight Climate Change

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Climate change has been a cause for growing concern, and rightly so. As global economy grows, production and consumption continue to grow, with consequent growth in the need for energy and carbon emission. This is putting the planet at great risk. Studies have proved that the rise in the earth's temperature needs to be limited to 2°C above pre-industrial levels if our children are to have the prospect of a green future. While this translates into the seemingly large allowance of 1,000 billion tonnes, the fact remains that this will be reached within 20 years if change is not implemented right away.

COP21, held in Paris at the end of last year, brought to light all these facts and allowed nations to be a part of a historical agreement to combat climate change and unleash actions and investment towards a low carbon, resilient and sustainable future.

The role that renewable energy plays in this mission was clearly identified, with countries committing an increase in their renewable energy installations as a means to support economic growth while mitigating the risks of climate change. This led to the distinction between environmental responsibility expected from developing and developed nations, especially with regards to carbon emission; and this differentiation was considered across all pillars of action including mitigation, adaptation, finance, technology capacity and transparency. Developed economies have been recognized as the largest consumers and, as a result, the largest producers. This increases the onus of protecting the environment that falls on them. Furthermore, it also adds upon them the responsibility to support their developing counterparts with financial and technological resources to enable global advancement without affecting the environment.

The commitments made by the developed countries included carbon emission reduction, renewable energy installation increase as well as support for renewable energy, carbon capture and energy efficiency to other countries. These commitments came from Malaysia, Bahrain, Uruguay and Australia amongst others. Developing countries, on the other hand, had commitments more focused on increasing renewable energy installation to support their industrial and consumption needs. Furthermore, they were also focused on reducing their carbon emissions at the outset so that economies such as India, China, South Africa, Brazil and Sri Lanka could be built on clean energy. At the same time, these nations offered clear indicators of the support they were expecting from their developed allies.

India played an important role at the forum, pivotal in making the agreement supportive of developing nations' needs. With the target of 175GW of renewable energy by 2022, India is heavily vested in mitigating climate change risks. This target was therefore further complemented at COP21 with the commitment to reduce carbon emissions by 30% to 35% and increase renewables to 40% of the energy mix by 2030. At the same time, India demanded for IPR-free technology to lead to faster adoption of clean technologies. We also requested a review of gaps in implementation by developed countries in order to measure their mitigation commitments and pledged support for technology transfer, finance and capacity building to developing countries.

Commitments made by India were based not only on the nation's energy needs, but also on Prime Minister Narendra Modi's pledge to mitigate the risks of climate change and curtail the potential damage that could be caused, worldwide and in India especially, by global warming. His vision led to the launch of the initiative of the International Solar Alliance in collaboration with French President François Hollande.

While discussions and debates brought forth many points on the position of developed and developing countries on the climate change front, the biggest achievement at COP21 was the specific nature of the commitments made by nations from around the world. Overcoming the ambiguity that existed in previous commitments, COP21 ensured that nations became a part of the agreement by outlining specific targets and actions, thereby ensuring that the world works, collectively, towards powering a greener tomorrow.

OMS - Role in an Integrated Business Model

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This article attempts to bring in the author's perspective towards the role of OMS (Operations, Maintenance and Services) within the lifecycle of the turbine. The scope is largely centred on offering extended warranty to onshore installations in India.

Wind Energy: A Look at the Indian Scenario

Humans aspire growth and energy fuels growth. However, renewable energy fuels growth without the undesirable consequences brought about by consuming non-renewable energy. The total renewable energy capacity installed in India, as on 30th November, 2015, stands at 38.3 GW*. 25 GW of this, which is approximately 65%, is through wind energy generation**, making India the fourth largest wind energy producer in the world***. This feat has been made possible due to the visionary leadership of the government, both Central and State. Other criteria that contribute equally to the success of the sector include technological advancements and the entrepreneurial spirit of the business community, especially customers, manufacturers and suppliers.

Investment: A Customer's Perspective

Customers invest in capital goods to create wealth. They invest in the service of, and expected return from, the product. Two key criteria determine the investment decision: 'Return on Investment' and 'Risk to Reward Ratio'.

The Return on Investment is determined by project cost, AEP (Annual Energy Produced) and tariff. The project risk is determined by the contract type and its execution. The wind energy sector offers a variety of solution options to customers; whilst most opt for full turnkey solutions. A few large players opt for an aggregation model for some of their projects where they purchase the equipment from an OEM (Original Equipment Manufacturer) supplier whilst insourcing or outsourcing some of the other parts which include site and infrastructure, installation and OMS (Operations, Maintenance and Services). This option is generally availed in situations where the turnkey option is not available.

Critical Success Factors

In addition to project cost, the tariff and the turbine/site compatibility are two factors that determine potential ROI. The likely deviation between potential ROI and actual performance is determined by the project execution and OMS implemented during the lifecycle of the asset. This deviation can be negative or positive, and is often cyclical due to diurnal, seasonal and long-term wind cycles. The contributing factors can be simply compared to the life cycle of a human being as follows:

1. Genes: The turbine design and site is given at any point of time. The turbine/site compatibility determines the DNA: Potential AEP (Annual Energy Production).
2. Birth: The process from manufacturing the equipment in the controlled environment of a factory to its installation and stabilization in the natural environment of the wind farm determines the quality of birth.
3. Lifestyle: The nurturing of the turbine in terms of its monitoring and servicing through its lifetime determines its health and longevity.

The key indicator of turbine performance is AEP and one of its lead indicators is MA (Machine Aavailability) which in turn is influenced by MTBF (Mean Time Bbetween Failures) and MTTR (Mean Time to Repair). Increasing MTBF and reducing MTTR increases MA. Higher MA during the high wind season yields higher AEP.

OMS: The Customer's Custodian

The long lifecycle of capital goods has the intrinsic tendency of wear and tear and hence, these products have the need for periodic servicing as well as replacements of various components. Further, capital goods sometimes have opportunities for further optimization through technological advancements or through better alignment with operating conditions. The OMS has a key role to play in all situations and various stages of life and at both, turbine and wind park levels.

OMS Mobilization: The first OMS contract is generally signed at the time of the equipment supply contract. Before the active role on the turbine and wind park begins, the OMS machinery (Team, Systems and Infrastructure) is geared well before the equipment reaches the site. The OMS team is familiarised with the product and trained to service it, as well as sensitized to

what signs to look at within and beyond the articulated checklist. Infrastructure to cater to the needs of the turbine + wind park, as well as the OMS staff, is set up at locations in proximity to the turbine installation for rapid service deployment.

Pre-commissioning checking and testing: The trained staff is certified for its competency on skills as well as ability to manage various possible scenarios. Parts of the equipment may be inspected at the factory, prior to installation and before commissioning. Post-commissioning tests are conducted or overseen and punch lists are created and cleared before the OMS team takes charge. During this stage, the maximum potential birth defects are attended to. The observations feed into the incoming systems to reduce/eliminate future instances of avoidable turbulence – which means better birth. A similar exercise is carried out at the wind park level.

Lifetime Servicing: There are three key parts to this - the SM (Scheduled Maintenance), the BDM (Break Down Maintenance) and the Analytics.

- At regular intervals, the turbine and infrastructure needs attending to in terms of recalibrations, change of consumables and replacements of parts. There are schedules to this for every machine type and climatic zone which get refined to individual wind parks. Adherence to this in letter and spirit is tantamount to a healthy lifestyle.
- Breakdowns do happen and the general causes are the genes, beyond envelope of working conditions or gaps in healthy lifestyle. Finding root causes and implementing corrective action reduces the MTTR. Working on the preventing action leads to increasing the MTBF.
- Based on the RCA (Root Cause Analysis) of above two and the constant monitoring of the working conditions envelope, wind, other weather conditions and Machine Operations SCADA (Supervisory Control and Data Acquisition), data gets converted into information. Combined with advancements in technology, possible options to reduce negative deviation as well as increase positive deviation surface. Business cases are tested towards net benefits and presented for implementation consideration.

OMS Synergies through an Integrated Business Model

The role of an integrated business model cannot be underplayed. Wherever a strong collaboration exists between the OMS, technology, supply chain and infrastructure development teams, the opportunity to upgrade the turbine to reduce negative deviation as well as improve positive deviation is high. Negative deviations are reduced through predictive maintenance and consequently increasing the MTBF, reducing the MTTR and refining the control systems. Positive deviations, whilst increased by the earlier steps, get further enhanced through repowering options via changes in generator capacities, blade design, and hub height and so on. The same inputs also contribute towards designing better as well as advanced turbines, infrastructure and support systems.

Industry Trends and OMS - Potential and Future Directions

OMS has always been an important part of the overall lifecycle. With time, its criticality towards higher generation has increased significantly. Advancements in digital technology and IoT (Internet of Things) lead to advancements in turbine control systems, PM (Predictive Maintenance) as well as forecasting accuracy of power generation.

Multiple factors are leading to the steady growth of the wind energy sector in India. Technological advancement, availability of competitively priced equipment and positive government policy framework has made wind energy the most favourable choice for capacity addition in the country. The National Action Plan for Climate Change has set the target to achieve 15% contribution of renewable energy by 2020 which has led to an estimation of 7,000MW addition per annum. Aiding this target is the expected investment of over 4,000MW per annum brought forward by the announcement of Prime Minister Shri Narendra Modi during the Clean Energy Ministerial in New Delhi.

The increased demand for energy brought on by the 'Make in India' initiative as well as the growing awareness of the risks of climate change have increased the attractiveness of the wind energy sector. As more and more people choose wind to meet their energy needs, the demand for domestically manufactured components such as towers, blades, generators and converters among others is growing. As a result, India is emerging as the fastest growing supply chain manufacturing hub of wind energy in the world.

The viable environment and growing market has led to increased competition within the industry, and players are now looking at new ways to enhance customer experience. One way to do this is to provide not just wind turbines as a product, but to bring to the customer an end-to-end solution; and OMS, with its application to every stage of the lifecycle of the asset, is the ingredient that is required to make this possible.

*Source: MNRE.

**Source: IWTMA

***Source: Global Wind Energy Council, as at January 2016