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POSTAL REGISTRATION NO.: HD/1153/2014-16

www.energynext.in

Energy Next

Your guide to Renewable Energy

Volume 7 | Issue 06 | April 2017 | Hyderabad

RNI NO.: APENG/2010/38296

Date of Publication: 08/04/2017 Date of Posting: 10/04/2017

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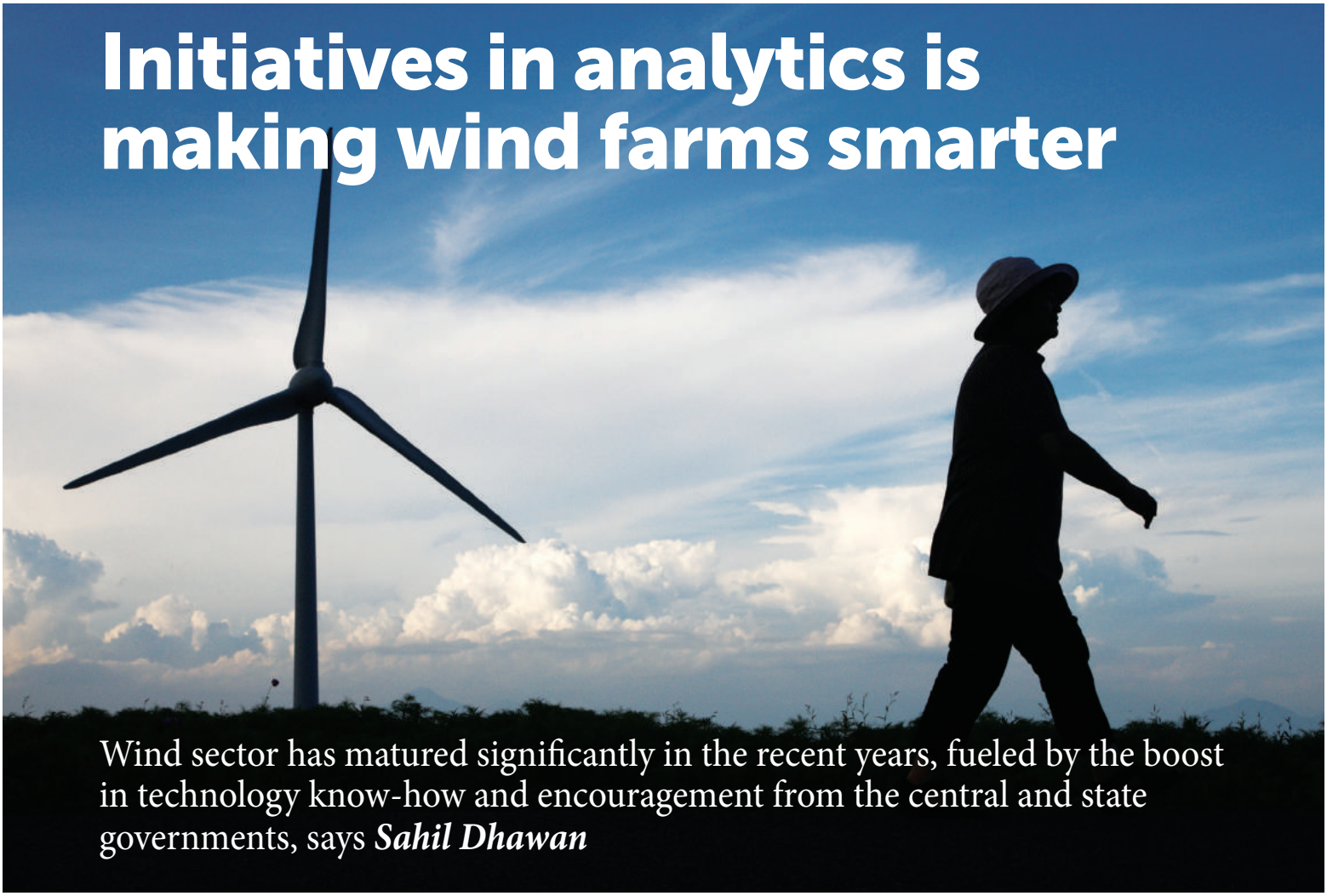
Initiatives in analytics is making wind farms smarter



Wind sector has matured significantly in the recent years, fueled by the boost in technology know-how and encouragement from the central and state governments, says ***Sahil Dhawan***

As environmental and energy security concerns continue to engulf economies around the world, renewable energy has emerged as one of the major priority areas for meeting international sustainability goals.

India, which ranks fourth after China, the USA and Germany in terms of total installed wind power capacity, took the largest renewable capacity expansion program in the world, setting an aggressive targetto add over 2 lakh MW of renewable energy capacity.

Among other initiatives, the county also announced the National Action Plan on Climate Change (NAPCC), which will further expand the country's renewable energy portfolio manifold. This, along with the government's target of reaching 60 per cent of electricity capacity from non-fossil fuels by 2027, will give impetus to the growth of the wind energy sector in the country. Wind energy has been leading the country's renewable energy market for the past two decades. At 28.5 GW, wind energy is India's fastest growing renewable energy and makes up about 61 per cent of the total installed renewable power capacity in the country.

Wind sector has matured significantly in the recent years, fueled by the boost in technology know-how and encouragement from the central and state governments.Achieving the ambitious growth numbers would need this asset intensive industry to leveragedigital technologies such as data analytics, cloud technologies, machine-to-machine learning, and sensor monitoring, which result in significant cost benefits.

Such solutions will be of paramount importanceto the operation and maintenance (O&M) players, who manage and run wind farms,as they are primarily involved in improving productivity and generating high return on investment (ROI) to stakeholders.

MANAGING ASSETS – THE DIGITAL WAY

There are many areas where technology and digitalization can play an important role. One such is asset management. Companies in the wind energy sector are looking to maximize returns from thewind mills and enhancetheir production and performance by emphasising on the windfall (production side), maintenance of

the equipment, regular service of wind farms and increasing the up-time of the windmill.

Asset management and maintenance practices haveadvanced in a drastic way over the past few decades, much like the evolution of the industry itself. During the initial period, also termed the traditional era, maintenance of assets was done only during the time of a breakdown. This slowly moved to scheduled maintenance, where services to the assets were planned at regular intervals, irrespective of a failure being recorded. The next phase was that of preventive maintenance, wherein the firm had set conditions and parameters, which when reached, a service was done. With the advent of digital technologies such as cloud computing and analytics,the industry is shifting towardspredictive maintenance, which takes into account both predetermined conditions and parameters, as well as historical data from ERP (Enterprise Resource Planning) systems, while schedulingservices.

Along with predictive maintenance,wind power analytics facilitateswind and weather predictions and overall turbine and wind farm performance. Companies must weigh-in the types of data sources, the location of those sources and the different type of algorithms to help provide the right analytics. The data is obtainedfrom saved historical material, machines connected to IoT devices, turbine vendors, information integrated in business systems, and other external sources such as on environmental conditions tracking the extreme conditions the windmill or the equipment is placed in. This allows companies to acclimatise to the variable nature of wind power, report under performance, predict failure and need for maintenance.

A study by Sandia laboratories [part of the National Renewable Energy Laboratory, US] shows that substantial benefits are received from using a computerized system and gleaning the data generated from the wind farms, toanalyse trends and predict failures. It estimated that computerized maintenance could result in a 5 to 10 per cent revenue improvement.

Another significant areais that ofinventory management. When there are large or multiple windfarms, there is need for streamlining operation and maintenance processes. If done properly, it yields better results in terms of Return on Investment (ROI). With analytics,having become mainstream in the sector,companies are well informed onthe tentative failure and maintenance schedules, leading to better planning of spare parts. For example, products that need to be changed and have a wait time for procurement, can be pre-ordered and stocked so that no time is wasted when predictive maintenances are scheduled.

Similarly, analytics has applications in planning workforce needs, scheduling availability of people during breakdown or maintenance and hiring during lean time. With wind farms being located at remote or coastal regions, accessibility to workforce is always expensive, especially in times of urgency. Since large part of the workforce issigned on contract basis, predictive analyticsdrives significant reductions in hiring, operational and maintenance costs.

When it comes to overall planning, digital wind farms provide benefits on multiple fronts. For instance, creating digital models or simulations of wind mills give an estimate ofthe electricity or power produced in a given period of time,which can be stored and sold effectively. Demand and supply can be predicted basis these conditions, as well. By leveraging analytics to help machines optimize themselves,companiesget to generate more yield and productivity out of their existing capital resources. For example, by having the turbines to pitch themselves in a way that can optimize the same level of wind,the production capacity can be increased.

Mobility technologies and creating apps for asset or customer service will support in better information gathering. Smartglass technologycan also be used advantageously toteach engineers to assemble wind mills in remote places, and assist service engineers in servicing motors, wind and unwind motor pumps, etc.

NEW DEVELOPMENTS ON THE ANVIL

Nowadays most wind mills are semi-digitalized and we can soon expect wind mill clones, scanner and sensors in every place. Further, with the help of Enterprise Resource Planning(ERP) systems, we will be able to build analytics to see the areas where there are inefficiencies, be it the issues with assets or issues with workforce.

The immediate thrust of companies should be on exploring thenextgeneration technologies and partnering with suitable solution providers, to sustain competitive advantage.

India's wind energy sector has the relevant experience, technology, reach and spirited approach to enable a faster transition towards clean energy. Among the many significant implications of digital technology will be stabilisation of demand and supply. This will be a result of better predictions, planning and rise of nextgeneration fully digitized windfarms with a thin layer of operation and management process, more machine-to-machine connect and minimum human intervention. These will eventually make wind sites a viable option, thereby ensuring better yield, reduced costs and affordable power for all. The coming years will see more disruptive changes in this sector, with the adoption of more emerging technologies.

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