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Paper on Effective O&M for Performance Improvements

Preamble :

The investment in wind power project today is predominantly related to availing in ones business, capital investment depreciation for better cash flow and which is not purely tax avoidance. However, the trend is changing where investor is looking for assured sustained returns over the life of the plant, which is generally 20 years. Looking for financial gain in the initial years of the project is a universal phenomenon. In India accelerated depreciation tax program is being encouraged to continue for some more years. One expects the change for Government giving the thrust or benefit to the project, based on the generation. This is bound to come and also shall create a different drive while not only conceiving a project but also giving the right attention by all the stakeholders, not just by the investor. Such changes can only force monitoring the performance but also initiate various methods to improve the same, to gain optimum generation and thus get maximum returns from the project.

While accepting the philosophy of effective O&M of any capital equipment is same every where and is applicable to wind turbines also, there need to be a slight twist not only in the approach but also should prevent from one to accept "that is the best possible" excuse & withdrawal.

Like any other production unit driven by good systems and processes to not only in monitoring but also continuously apply improvement methods, the operation of wind power project also should be subjected to same.

The various aspects like wind turbine's location, infrastructure conveniences manpower, distances from nearest civilized dwelling, approach constrains etc. call for special attention unlike managing O&M of equipment in a plant. At the same time not having the proximity by the beneficiaries of investment shall reduce the natural response feedback effectiveness. However much reporting is expected by the service agency on the performance, it is understood that there is big gap between what is reported and what can be sought to get the right understanding of the day to day performance.

So effectiveness of O&M is very difficult to define precisely. In simple terms, it can be summed up that there is very good turbine availability more than 95%, after taking into consideration of both wind farm grid and also grid line upto the substation. Since there is serious dependence on winds and this vary year after year, the effectiveness in terms of only looking at generation cannot be considered. One should strive for keeping machine as much time possible ready to generate.

One should not get satisfied what is achieved. Mere analysis of various parameters will drive some improvements continuously.

These improvements are also not common to all types of projects. If so, one can ask why should it not have been done in the first stage. So these improvements are project site and region specific. It is the urge to make it better shall get one same clue and again the cost of economics of making such improvements is also important.

The effort what is required cannot be one sided. It is not only the project developer and O&M Agency to try but also there should be need or urge by the Investor. Investor can seek the change only when he is able to understand his investment and performance parameters, which drives this change for mutual benefit.

In the present scene in India, the lack of knowledge of the investor to some extent can be a cause for the present performance below what is easily possible.

Once there is little awareness to the investor, automatically more inquisitive questions popup and these lead to improved understanding, which in turn is a cycle of new challenges to the service provider and at the same time better knowledge of whatever happening to his investment.

The service provider may also lack any incentive to do better. His fee is not related to his excellence. In India, the development of projects are not like other countries where Developer or Agency, who takes care gets regular income based on what he does. In fact in some projects, the landowner continues to be stakeholder for the success of the project. In India, it is totally different and hence there is a necessity for demanding the optimum service or upkeep leading to best returns to the Investor.

In the monitoring mode it is not just to keep tab on the generation only. Unfortunately, the inference one can get from every months generation is difficult to point out about the performance. But one can easily give the reference only on wind, that too more notionally and not scientifically. Only at the end of year or end of season, the cumulative generation shall reflect the performance, mostly in comparison to last years. One can also make comparison of similar rating turbines in the vicinity, which in turn shall not only reflect the wind pattern but also grid availability. It is not just getting the net generation comparison, but one should analyse different parameters causing the variation. Even wind effect can be judged by having independent wind monitoring station at site, when one has significant project capacity and investment.

Instead of waiting till the end of a period, it is better to review every month, or even daily depending on what is the risk one would like to take.

It is not only to compare the previous year generation but also the neighboring wind farm, giving some clue whether there is any problem or the report is not done right.

It is also easy to compile the data of all faults and stoppages, which will define the priority attention needed and also one can predict to some extent future part replacement. Repeated problems need a different approach. It may be necessary to examine under what conditions such problem occur. Some even attribute unique turbine serial number and it can be a wrong machine settings too.

Unless site staff does not go into continuous dissatisfaction questioning mode, the real issue will not surface. There is always less tendency for one to question overall costs, which includes parts cost and repetitive attention on a machine go unnoticed for detailed examination of such easily avoidable problems.

Here empowerment of direct people who get involved at site and to encourage finding their own way, a permanent solution would also beneficial.

Some tendency of not giving the ownership to the problem solving quickly and trying to centralize all directions without giving reasons, shall lead to disinterest post office type activity of fixing the machine problem. This may also ignore to register the symptoms of machine and other fault status conditions causing further deterioration in the machine systems.

So HR issue of site staff plays an important role, mere good attitude can reduce down time saving the substantial generation. This aspect of human relation is seldom considered important by the service management.

There are instances of mere participation approach, with no encouragement to share all the information for the turbine behavior and many fault instances and remedies don't get even recorded shall decrease the efficiency of such a team.

On the connectivity front all possibilities are to be explored to make it conducive for last interruption. Just like the quality of the turbine is imbibed by the technology, design, manufacturing under systems and standards the connectivity (line) elements of the project also are to be examined for reliability using high standard parts. One can have circuit configuration for a large project in the most flexible operational switching way.

This comes from all the observation one makes during operation and analysing grid related breakdowns and interruptions. Sometimes a small element in line system can shut a group of machines and hence these become very important.

The preventive maintenance, even though is a routine protocol to follow, as per manufacturer guidelines, it also needs continuous change, review. The observation made each time, in the machine shall be very useful.

Experiences of Major improvements done in our project

1. Upkeep of the project site, after completion of all project activities in different periods.

2. Distinguishing between site internal line down time from down time of external line between utility substation to wind farm site.

   Over a period in our site grouping of all our machines were done and connected to one circuit line and eliminated disruption of supply, due to faults in others machines and circuits. It helped us also to distinguish two different technology machines and take advantage of the special characteristics in operation.

   Taking responsibility for the Preventive Maintenance of this external line during off-season with coordination of utility company, even though this line now belongs to utility company after project completion.

   Attending to the inbuilt defects of this line, due to rush-rush project completion approach instead of doing the project for better uptime and quality work.

3. Added a circuit breaker (VCB) within the site before the external line start and thus grouping all the different metering point lines (considerable length within site) to give protection of line within site and avoid circuit tripping at

distant utility company substation, for faults within the site, beyond the metering points and our group circuit breakers (VCBs).

4. Added a distance protection relay for this double circuit 33 KV line between site and substation at 35 KM, to locate the line faults without wasting too much of time in patrolling the line and fault location finding. This reduced considerable external line outage time.

5. Made even minor modification in the grouping of different turbines, which were added in stages, so that there is the least time of shutdown for attending, on a machine or a specific group of machine.

6. We had turbines with transformers mounted on towers and isolators were provided on the towers. We did modification to eliminate interruptions to attend the machines and also line breakdowns, a group of machines to be stopped each time.

7. The Management Information System and reporting on the performance of the project in totality was developed. This is different from what was generally reported to customer. The report shall cover not only the generation, breakdowns, interruptions, the recovery costs in terms of RKVAH and KW power used, line loss and also predict symptoms of the repeated problems and machine adaptation issues.

8. Periodical study of all recorded machine stoppage – reported and not reported (when not being significant duration) to assess the future deterioration of machine systems.

   Some of the interruptions, which are put on 'auto start mode', also are monitored through SCADA machine data to seek explanation from manufacturers and ask for improvements wherever possible.

   Even machine software changes introduced periodically were scrutinised by us for its effectiveness and examine whether a wrong change would cause new problems.

9. Power evacuation issues of our project at connection point are also studied to force necessary remedial action through developer and working with the utility company.

Some of the machine settings advised by the principals was questioned, as they were not matching with the site conditions, calling for review and effect changes. It is possible to have effective transfer from labor oriented individual machine setting to group control settings through SCADA by software changes, helping in saving manpower time but also to have closer monitoring.

Conclusion: it is generally considered that wind turbine operation & maintenance is just similar to any other power plant maintenance. It has been seen with different reasons put forth in this paper that there is much more than that. It is the continuous exploration to optimize and one can try to bridge the gap, between the actual performances versus estimation, as conceived at the time of the investment, if returns are on the lesser side.

The general experience so far in India is different from other places in the world due to approach we normally adopt in the lifetime of the turbines. There are no turbines already having gone through the general expectancy life of 20 years, in India. It is difficult to conclude the characteristic causes of good or

bad performances. It is also difficult to speak authentically what is specific to Indian operations. So we also need to develop a data bank on all turbines over the years to make proper analysis for reference and also set some standards applicable to Indian operations.
