Three Years of Nuevosol; The Journey of Mounting Structures.

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Nuevosol completes three years of operations this September. This milestone is definitely worth rejoicing about, but we at Nuevosol believe that the journey we've endured to achieve it is worth sharing. Our entrepreneurial experience of optimizing mounting structures has always been subject to a rapidly changing and challenging Solar Energy sector, but a strong design-oriented approach and the willingness to adapt and deliver has always helped us tide over these challenges. We've been ready witnesses to the paradigm shift that the value chain of mounting structures, consisting of manufacturers and contractors, has undergone. These changes have been all-encompassing and not just limited to procedural changes or improvements in infrastructure. Mounting structures have officially emerged from excessively conservative, cost-ineffective designs and have become more liberal and open to experimentation. Nuevosol takes specific pride for having contributed to this process and, in most cases, for sowing the much necessary seeds that have shaped the sector into what it is currently.

Era of Incentives and Imports; Urge to Localize.

Necessity is the mother of invention. Nuevosol, was essentially born out of an urgent necessity for localization of the engineering involved in design and execution of solar power plants. When the solar mission in India was launched the industry was entirely dependent on imports. While import of modules and electrical equipment was inevitable, an abundance of indigenous engineering experience and a matured steel industry rendered the import of structures cost ineffective and avoidable. There had been instances when entire steel structures were imported. This was still viable at that time because the industry was majorly driven by subsidies and incentives put in place by prevalent policies. In hindsight, these incentives were so luxurious that they acted as a hindrance to innovation. While the industry was still reasonably comfortable with imports for smaller sized power plants, there was a strong urge to localize the manufacturing for large-scale projects. International conglomerates saw this as a lucrative avenue in the making. They would start by selling their designs directly to clients, and then eventually establish a vendor base around the country that could manufacture those designs in order to flood the sector and cement their foothold in the Indian mounting structures industry. Unbeknownst to them, a few barely-out-of-university engineers had similar ideas, the difference being – the young engineers possessed an indigenous cost-effective design, the kind of design that could produce mounting structures at a minor fraction of what the international conglomerates would quote. And thus began Nuevosol in September 2011.

Thinking beyond the conventional; Optimize and not Compromise.

To design and produce indigenous structures meeting all the design requirements of a power plant, yet optimized to be financially and operationally feasible – this was the lone objective of Nuevosol. Nuevosol believed in grid parity, and in optimization of solar power plants on multiple fronts to achieve grid parity. While most experts were insisting on incentives and lowering of module prices with falling dollar value to make grid parity feasible, Nuevosol has taken up the challenge to optimize structures to the best possible extent and contribute its share towards achieving achieve grid parity. Nuevosol's main tool to achieve this is optimization of mounting structures in multiple fronts, which will in-turn optimize the BOS to reduce the overall cost incurred. But to optimize, one has to think beyond the conventional, which is almost always met with resistance and then hesitance.

Nuevosol's optimized designs found much resistance from the conservative quarters who relied on outdated norms and standards, which made the structural design over-redundant and overtly safe. The main reason behind this conservativeness was the lack of an Indian solar structures-specific design standards and codes. Most European countries possessed solar industry-specific design standards and a majority of the credit for proliferation of the solar sector in Europe can be attributed to this very initiative.

Lack of solar-specific design experience in the Indian industry necessitated an excessive dependence on construction codes for buildings with very high factors of safety, which are non-essential for design of mounting structures. Not just the safety factors but the material usage, galvanization coating thickness, foundations used etc were so redundant that the structures had become economically unviable. What the industry needed was lakhs of modules to be mounted in a limited area, on structures that can be handled by a human being, albeit with safe foundations and an ability to withstand strong winds and quakes. What were being built were bulky structures that were being designed to withstand an improbable Armageddon, and were impossible to mount without heavy mechanical assistance. At this juncture Nuevosol, stuck to its motto of optimization and worked unrelentingly towards educating the industry on how solar mounting structures can be optimized by moving away from a conservative mindset.

By mid 2012, the industry was more welcoming to the usage of the optimized structures and realized that they were the way forward. Newer material like pre-galvanized steel were introduced, newer section profiles of C-sections, L Brackets were introduced to ensure the structure cost goes down considerably while the durability is not compromised. This tide of change, where optimization was encouraged and incentivized provided the key boost to Nuevosol, and provided it with some of the most challenging and first-of-their-kind projects in India.

Bigger, Faster and Better- Setting the Standards

Solar mounting structures design-specific standards have not yet been framed or published till date. But as the industry started to mature a set of standards emerged which were acceptable to most firms. Nuevosol played a key role in setting these design standards. The process involved setting these standards in line with the optimization objectives. Optimization of structure design

for cost saving was the first objective, which Nuevosol successfully achieved and in doing so the industry consciously progressed towards a complete paradigm shift in material usage. It went from usage of 100 micron coating thickness to pre-galvanized 550 GSM steel, from using reinforced concrete foundations to insert – post foundation designs. This gave a major boost to innovation at Nuevosol.

Starting Mid 2012, the solar industry witnessed a major growth in business, with mega power plants forming the portfolio of major European and Indian EPC firms who started early to make a mark in the Indian Solar industry. The mega power plants with capacities of 25 MW and above needed to be executed in less than 40 days, for many reasons like policy lapsing or claiming of accelerated depreciation. Though highly experienced with over 10 projects and 30 MWs executed in the first year of operation, this was a mountainous challenge ahead for Nuevosol, which was yet to execute a project of 5 MW or above as on September 2012. Nuevosol now had to train to punch above its weight.

This challenge opened up newer avenues for innovation. While continuing the efforts in reducing the cost of structures, a need for multi-frontal optimization was felt to achieve faster and better completion of large-scale projects. At Nuevosol we implemented a process, which is design-centric, where there is an integration of manufacturing and installation optimization with that of design optimization. This has been called the Cybernetic Design Process, where there is a free flow of information from geotechnical, manufacturing, installation, and material research divisions to and fro to the design department. This process ensures the structures are designed with features of easy manufacturing and faster installation.

These structures designed for easier manufacturing and faster execution, helped Nuevosol execute at a record pace of 100 MWs in a span of 3 months between November 2012 to March 2013, and Nuevosol was trusted by the industry for being capable of designing, supplying and installing mounting structure at exceptional speeds. Nuevosol had earned a reputation for taking up challenges. Anything new, anything big, everything good - had become Nuevosol's motto.

Many Firsts- Innovation Taking the Lead

Exactly a year ago in September 2013, there was a surge in the number of projects being executed all over India. In mounting structures, which involved a lot of customization unlike many other off-the-shelf items, demand was far exceeding the supply by a large extent. We at Nuevosol, found that optimizing structures for faster manufacturing and easier installation was not the only solution to meet the demand. There were other ways of increasing the output, which needed innovation, testing, validation and certification. There was a need to improve the basic facilities a manufacturing yard consisted of. An effort at optimizing the shop floor, improving the logistics of delivery, streamlining the processes for installation with shrewd project management was required to ensure that the biggest solar power projects India was yet to witness were executed at a record pace.

Project management, risk mitigation, and taking the lead to implement state-of-the –art execution techniques was not sufficient to improve the pace of execution. Many projects had targets to be executed at more than 1 MW per day and supply of more than 100 MWs per month. This was a challenge especially with heavy rains in rainy season obstructing work and with extremely hot summers reducing the number of productive work hours per day per individual. Nuevosol felt the need to understand the production and installation bottlenecks. And so, apart from analyzing the need to improve, Nuevosol also brought out solutions to improve production outputs, to instill procedures and to encourage newer installation techniques.

Nuevosol in FY 2013 -2014 executed more than 250 MWs. Many of these were the first of their kind that Indian solar industry has seen. Nuevosol introduced four new rooftop products and implemented solutions on more than 50 roofs in a very short span of time. Inclined metallic roof mounting, non-penetrative concrete roof mounting was done on many prestigious buildings. From being the first to follow a bi-directional contour upto twelve degrees to constructing biggest carport structures, Nuevosol was trusted by the biggest EPC firms for taking up challenging tasks.

One phenomenal change which the industry has seen was the acceptance of many newer materials other than hot dip galvanized steel. Nuevosol has executed more than 100 MWs with Galavalume, which was a welcome change in the industry mindset. Material research backed by laboratory testing helped Nuevosol to propagate the use of newer materials.

With the growth of mega power projects, industry had to resort to acquiring lands at very low prices often ending up procuring rocky hilly terrains in Madhya Pradesh or sandy soils in Rajasthan. This had adverse effect on project feasibility in some cases due to amount of leveling involved in hilly terrains or the cost of foundations in silty soils. Nuevosol introduced two new concepts in dealing with these challenges. Adapting the structures to the contour in hilly terrains saved the costs involved in leveling and grading activities and was lauded by industry giants as a game-changing move. Over 50 MWs was accommodated across 300 acres of harsh, rocky, hilly terrain. In silty soils, Nuevosol introduced the concept of special foundations and wind tunnel analysis to ensure the layout is optimized for varying windspeeds throughout the layout. Nuevosol had to collaborate with German Institute specialized in this testing activity to conduct these tests.

One more important development in this period was the PSU projects taking the forefront. The challenge in executing these projects was to adhere to all the norms while being the lowest bidder, as the norms for design were too outdated or over-redundant. At Nuevosol we have always been at the forefront to obtain approvals from certification agencies, for the most optimized structures. Nuevosol acquired approvals for rod foundation, portrait orientation, which were away from the standard norms. It was a trend-setting phenomenon when Nuevosol got approvals for the usage of Galvalume in one of its recent projects for a PSU.

The fight for Righteousness

The three major challenges that the mounting structures industry is experiencing currently are the infiltration of quick-fix design concepts with excessive leaning towards cost-cutting, manufacturing bottlenecks due to excise duty uncertainty, and the steady transformation of the industry into an inconsiderate buyers market.

Design optimization has widely been accepted in the industry. This has led to a sudden surge in the number of consultants and designers who tend to work under the guise of design optimization, but owing to their limited previous exposure to the sector cut corners in critical areas. The result: longstanding consequences on the longevity of the plant. Every site is unique and mounting structures have to be customized according to the loading parameters that the site is subject to. Adapting a standard design for all locations, although convenient, will progress to an at-loss situation for the client in the longer run. Even a new entrant to the industry

designs for a 180 kmph wind speed, and has basic knowledge of coefficients k1, k2, k3 and other critical parameters. These very same parameters can easily be manipulated to promote a design as safe, durable and effective on paper. The microscopic defects, however, can be identified only with keen analysis in simulation softwares such as Staad Pro. A design prototype and its visible structural integrity cannot be relied on entirely either, not unless the prototype structure is exposed to windspeeds in excess of 100kmph. A manual calculation of loads by any subject matter expert will conveniently rule out a majority of the standard designs being offered currently in the market.

Cost reduction is good and is a definite requirement in a highly competitive growth market. However, cost reduction at the expense of plant longevity will cause long-term damages to the sector and tarnish the reputation of established firms. Nuevosol has remained steadfast in its promise to deliver durability and quality with a client-first attitude, and takes pride for having remained clear of ethical grey areas.

A Buyers Market dominated by Supply Constraints.

Mounting structures market, which started as sellers market with abundance in supply chain has turned into a buyers market with many bottlenecks in the supply chain.

Firstly, a supply constraint has occurred not because of lack of manufacturing infrastructure of required production outputs, but because of a massive bottleneck created by the apprehensions in availing the excise duty credit by manufacturers. There have been instances when crores of excise credit acquired by manufacturers has been put into litigation due to uncertainty in the policy. This has discouraged many new manufacturers from foraying into the solar market and the existing manufacturers are now forced to limit their production targets. Nuevosol has contemplated and planned for setting up its own manufacturing unit, but has not ventured yet due to the prevalent excise credit uncertainty.

The change from a seller's market to a buyer's market swept the mounting systems industry when a huge number of suppliers and designers infiltrated the market with low quality structures. Many buyers unaware of the rampant design compromises that many of these low-cost designs possess gave-in thanks to the attractive pricing. Overnight, the industry turned into a buyers market with many sellers, though only a few of the sellers were genuinely qualified. Industry has witnessed its share of cases where structures have failed at low wind speeds of 100kmph inspite of being designed, theoretically, to sustain winds in excess of 160 kmph. Nuevosol has received numerous requests for rectification jobs in Rajasthan, where huge damages were sustained by 1-year-old plants owing to defective low-cost designs sold by these mass-marketing firms.

A good number of quality testing and certifying agencies have been in practice in solar structures industry and they have been doing a great job of keeping a check on sub-standard designs. These agencies need to be encouraged and need a firm push to promote them if the industry wants to eventually grow into a process-oriented industry with strong foundations in design and quality.

The industry off late has also been subject to a new disturbing trend - unrealistic demands of price reduction amidst rising prices of raw material, and equally unrealistic demands of project execution with poor planning from buyers. In the past three years the raw material prices have gone up by more than 20% while the cost of structures have been reduced by more than 40%. Unless the buyer understands that there is a limit to optimization with increasing raw material costs, the industry will not be rid of undue price wars. Similarly, while there has been a demand for executing projects at a great pace the various responsibilities of the buyer are generally neglected and undue execution targets are demanded for. Delays in procurement of MNRE Exemption certificates, and protracted delays in cash flows will eventually lead to delays in project execution. Buyers are the primary stakeholders and they stand to lose the most in case of project delays. Developers need to encourage frequent, proactive all-contractor meets for projects in order to ensure that every individual contractor is aware of his deliverables and his/her issues that might halt delivery of the same are voiced out and sorted immediately. The culture of the industry needs to change to a collaborative one from the existing delegate-and-penalize one.

Amidst all these hurdles, Nuevosol has remained supportive in achieving the demands of the buyer in meeting super-fast delivery schedules or super-low prices, but both delivery timeline and prices have now reached critical mass. Nuevosol is committed to providing the best support possible to all of its clientele, manufacturers and other stake holders in the industry. All Nuevosol seeks is an environment of mutual trust and good faith. Our focus has always remained on long-term quality retention and consequent value addition for clients and will remain the same. Rushing a process has almost always led to problems in the longer run, and if the Indian Solar industry has to continue flourishing a massive onus has to be placed on quality of installation rather than the rate of installing.

The Big Picture Ahead

Over the past 3 years mounting structures industry has matured by a large extent. Mounting structures are being treated as the backbone of the solar industry. There is a common consensus that mounting structures are the only components in BOS, which can form the pivot to holistic optimization of the complete power plant. It has been widely accepted that the quality and life of the power plant lies in the design and installation of mounting structures and the viability of the power plant lies in cost of and speed of the installation.

Nuevosol, in the past 3 years executed 450 MWs of turnkey mounting structures, with over 75 projects in 15 states. The projects ranged from below 1 MW to above 50 MW, and encompassed a variety of technologies, soils, foundations and unique challenges. Throughout this experience the main objective remained unchanged - improving and emphasizing the importance of mounting structures and sharing the knowledge to the community, which had to be educated to bring in a much-necessary paradigm shift in its thought process.

A number of solar manufacturing facilities and installation contractors, who were trained for the continuously-changing industry standards and expectations, were incubated and nourished under the protecting gaze of Nuevosol. All of them are an extended family for us and together we stand capable of delivering the biggest projects in the coming future.

Nuevosol has been striving and will continue to strive relentlessly towards a more ideal, mature, process-oriented industry that accepts innovation and optimization of mounting structures as the necessary crux to achieving and retaining grid parity. There is a lot more that needs to be done and we are not ready yet to rest on our laurels.

(The opinion and perspectives expressed here are my own and do not necessarily represent the postings, strategies or opinions of Nuevosol Energy Pvt Ltd.)