

Impact of COVID 19 Pandemic into Solar Energy Generation Sector

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Abstract: Shocking spread of COVID 19 pandemic has caught all countries off guard and disrupted all socio economical activities and anticipated huge human life as well as economical loss which are not easy to makeup despite huge economical stimuli. This pandemic has exposed the weakness of all claims of scientific and technological advancements made by mankind and post COVID 19 world's outlook shall change forever. Economic activities are suffering huge losses and early sectorial analysis with different methodologies giving inconsistent reports because this pandemic shall have multi dimensional, multi sectorial, multi regional effect and as COVID 19 pandemic is still not contented, more reports shall give insights of the problem with different viewpoints. This paper provides insights from project implementer's point of view on certain impacts solar energy generation sector likely to face in post COVID 19 pandemic scenario.

Keywords: Pandemic, COVID 19, Electricity, Solar energy, Economic loss.

I. INTRODUCTION

On March 11, 2020, within three months, WHO officially declared COVID 19 outbreak as *pandemic* due to its global spread and severity of the disease. COVID 19 was first reported in Wuhan, China on 31st December 2019 which quickly spread by that time with 0.118 millions infected across 114 countries. By that time 81 countries have not reported any COVID 19 cases, and 57 countries have reported 10 cases or less.[1]. From a scientific and technological standpoint, in the present day we are more equipped than ever to counter contagious disease outbreaks, however globalization, ease in travel, antimicrobial resistance, threat of bio-terrorism, newly emerging pathogens which are driven by ecological, socio-economic, and environmental factors the risk has increased of more pandemics.[2]. Pandemics are having a long history of mass scale disruption of normal human life and causing immeasurable economic loss. Estimated to be responsible for over hundreds of millions of human life with stalling or reversal of economy. In anpandemic, what matters is not only the number of deaths, but also the growth rate at which the number of deaths is taking place and best placed strategies are to reduce the growth rate and simultaneously ramp up facilities and search for cure.[3]

In today's scenario of COVID 19 pandemic, estimation of extent of damage is not possible with past pandemic events like Spanish Flu(1918) or financial crisis during 2008 because of today's complexity in human and economical situation. **A 'return to normalcy' will be shaped by the quantum of achievement of lockdowns, quarantines, social distancing and design of recovery policies and it shall have different results and in different timelines.**[4]

The necessity of electricity is always hard felt during disasters and outbreaks and life and relief without electricity is impossible where now whole countries are under partial or full lockdown or home confined but medical and emergency services, communications, R&D activities are working round the clock which triggers higher usage and quality supplies. Solar powered electricity is significantly providing the electricity needs and addressing the climate change emergency, and on a longer timescale it need is only grow. Demand of addition of solar electricity capacity is driven both by government as well as private due to several factors like falling cost of components, ease & less time of installation, flexibility, scalability, possibility of off grid electrification, abundantly available solar radiation, environmental factors, government incentives etc and it has scale up significantly with double digit growth at present and future. It is anticipated that solar power electricity generation sector will very quickly get back on track once COVID 19 pandemic is over.[5]

II. PANDEMIC

Derived from 17th century Greek word *pandēmos*, pandemic is a worldwide epidemic. Pandemic start from an epicenter and moves very fast via human to human transfer, affection huge mass and whose perfect cures are not available, causing widespread disturbance in life, economic & financial anxieties and human behavioral changes like panicky, abnormality, causticities, confusing, disorienting, distressing, scary, and stressful times.[6]

Pandemics have a long history from prehistoric period to modern age with huge loss on human life as well as stalling or reversal of economic growth. Pandemics have afflicted civilizations throughout human history with the earliest known outbreak occurring in 430 BC during the Peloponnesian War.[7]

Starting from 1900 AD till date, major pandemics has caused over 90 millions of human life loss with Spanish Flu (1918) being the deadliest in modern time estimated over 20-50 million human life loss&HIV/AIDS(1981- till date) with 36 million deaths estimated as major outburst.Spanish Flu infected over one third of world population at that time with India having its largest share of over 10 million human life losses and this is still the largest human life losses from any pandemic till date in modern age.

Human life loss due to war during 1900-2020 is estimated over 165 millions, whereas millions killed due to accidents and killed due to other disease during this period.It is estimated that manmade pollution causes human life loss over seven million annually, where as diseases, famine, starvation and malnutrition causes millions of human life losses annually.

In all previous cases of pandemic, the world was caught off guard with no vaccines, no anti viral and no antibiotics to treat the superadded infections.It takes from months to few years to develop public health measures for pandemics with different approaches like pharmaceutical interventions that include vaccination and the use of antiviral drugs, non-pharmaceutical interventions that include the implementation of measures at individual, household and societal levels.

When used appropriately public health and safety measures the spread of pandemic is possible to slowdown that gives valuable time for preparation and implementation of other measures such as vaccination for its containment and eradication.

These measures are expected to help reduce the total number of cases and deaths. Development of anti viral has been promising, these are recommended in the short therapeutic window and for prophylaxis when either a vaccine is not available or vaccination is inadequate, but their use is threatened by emergence of drug resistance. Although the vaccines may not give full protection, these remain the best line of defense and play a vital role in the prevention.

Most modern pandemics from 1900 AD till date is been caused by influenza (flu) viruses. Flu viruses can change from season to season. While health professionals are pretty good at predicting how the virus will change, occasionally a new virus pops up that doesn't behave as predicted. That's when a pandemic is most likely to occur because most people don't have immunity to the new virus.[8, 26]

Every year, on an average, 3-5 million cases of seasonal flu and 0.29-0.65 million human life losses are reported globally.[9]

A virus is a submicroscopic infectious agent described as "organisms at the edge of life" and it replicates only inside a living cells of an organism and can infect all types of life forms, from animals and plants to microorganisms, including bacteria and archaea. Viruses are found wherever there is life and have probably existed since living cells first evolved.[10]

Unlike bacteria, which are capable of replicating on their own in the right environment, virus infects a host, that host becomes a cellular factory to manufacture more viruses.

At least fourfold increase in new infectious virus is reported from 1900 AD and last 40 years the number of new outbreaks per year has more than tripled.[11]

The reason for this large outbreak is attributed to doubling the human population in last 70 years as well as increase in domestic livestock as now we have what we had total of last 10,000 years of up to 1960 combined.

III. COVID 19

The name "corona virus" is derived from Latin corona, meaning "crown" or "wreath", itself a borrowing from Greek κορώνη korónē.This was initially used in 1968 by an informal group of virologists in the Nature journal to assign a new type of viruses.

Corona viruses were first discovered in the 1930s when an acute respiratory infection of domesticated chickens was shown to be caused by infectious bronchitis virus.

Corona viruses are enveloped viruses with a positive-sense single-stranded RNA genome and a nucleocapsid of helical symmetry. The genome size of coronaviruses ranges from approximately 26 to 32 kilobases, one of the largest among RNA viruses.[12]

Before COVID 19, in 2003 severe acute respiratory syndrome (SARS), in 2012-15, Middle East respiratory syndromes (MERS) were other coronavirus outbreaks were also reported.The most deadly of all Corona virus disease outbreaks, COVID 19, within three months has caused multi millions infected till date.

COVID 19 is 96% similar to a bat coronavirus, so it is widely alleged to be start off from bats in China.

The interconnected world for fast pace development, COVID 19, which can survive several hours to days spread and grow from single point to almost all countries within three months which even before corrective and preventive measures are implemented.

The cluster method of industrial development, mass scale migration of manpower, and decrease in industrial manpower

living standards has contributed spread of virus significantly.[27, 37]. Higher economical exploitation of the natural resources along with better road and transportation infrastructure with lower cost of transportation makes the enterprise to look for outsourced components from the best available places, cutting across countries geography.[28, 36]

Global market becomes reality because of arrival of various e-commerce companies, which also increased the tour and travel and its related hospitality sector.[22]

The capabilities of these viruses of evolving is 40 million times faster than humans has made situation worse despite all technological developments human made, but our very growth only has made us more vulnerable.

In the living memory of over 99% human being, this type of global economic and social life shutdown was never seen before with severe restriction on normal socio-economic life for all rich and poor, with mostly affecting the people with per-medical ailment.

Till the time, the drivers of pandemic spread are human activities that are expanding on a global scale, including deforestation, farming amplification and the wildlife trade which shall increase in the frequency of animal-human contact and likelihood of future new disease appearance and faster spread, suggesting that pandemics will become more frequent and more devastating in the future.

Current evidence suggests that the virus can be spread through respiratory droplets after an infected person coughs or sneezes, between people who are within about 6 feet of each other, and possibly through touching surfaces that have the virus on them.[13, 32, 35]

IV. ECONOMIC IMPACT OF COVID 19

The COVID 19 pandemic has triggered a worldwide recession with heavy forecasted reduction in growth. Pandemics cause economic losses through multiple ways which includes short-term fiscal strains and longer-term negative demand and supply disorder.[14, 24]

COVID 19 created huge manufacturing and logistics distress. With numerous enterprises shutdown for long and no logistics available for transportation and storage. Raw materials, semi & finished products are standstill at various locations and not reaching to final destination.

The interdependency between raw materials till finish products are wide across globe with consumers widely scattered.[29]

Several perishable raw materials and perishable finish goods is bringing losses to enterprises.

Post COVID 19 pandemic, the cost of production shall be changed due to higher cost implications, higher time of production, higher cost of manpower, higher transportation cost etc.

Several procurements shall be stopped or delayed due to funds been diverted towards fighting Post COVID 19 pandemic.

Several worst affected sectors shall pass on the fixed cost for mitigating the lower revenue and resultant profit's losses.

The consumer behavior is also going to be changed and enterprises are to be ready to make themselves relevant in post COVID 19 pandemic scenario.

The mismatch between manufacturing speed and its consumption shall be very high, which also result in lower revenue.

Huge manpower movement from industrial cluster to their native places shall create huge challenge in starting industry to its earlier pace. Manpower resuming normal work shall also be in staggered with efficiency reduced.

Post COVID 19 pandemic, several precautionary measures and implementation of several governmental directives shall enhance the operational cost.[23, 33]

Epidemics and pandemics always have a disastrous long term shock on the country's financial health, which may further spill over to other countries across the globe. Economically poorer communities around the world are facing the heaviest odds of disruption in their daily living conditions.[15, 34]

V. SOLAR ENERGY

Electricity, an indispensable form of high grade energy plays a huge part in our everyday modern lives and is one of the most important fundamental needs in today world. Electricity facilitates all technological advancement and underpins a wide range of products and services that enhance our quality of life and stimulate economic productivity.

The global economy and electricity demand growth is linked and thus electricity demand is affected by growth of human population. Electricity is responsible for all forms of human basic needs of physiological, safety, social, esteem, and self actualization.²⁵

Electricity can be generated through conventional like coal, gas, petrochemical, nuclear etc) or non conventional resources like hydro, wind, solar etc.

Solar electricity generation is highest growing among all forms of electricity generation and from almost 1 thousand TWh out of total 28 thousand TWh of total electricity generation in 2020 with anticipated to be over 5 thousand TWh out of total 40 thousand TWh in 2040.[21]

The planned capacity addition in solar photovoltaic sector is 142GW in 2020, with almost 586GW power plant already in operation with almost 100GW capacity added in 2019 only.[16]

In 2019, global renewable generation capacity addition amounted to 2537 GW. Hydropower accounted for the largest share of the global total, with a capacity of 1190 GW. Wind and solar energy accounted for most of the remainder, with capacities of 623 GW and 586 GW respectively. Other renewable included 124 GW of bio-energy and 14 GW of geothermal, plus 500 MW of marine energy.[17]

The total workforce in 2019 was 3.46 billion, against this a total of 10.98 million employed in renewable sectors in 2019, solar PV accounts for 3.60 million, solar thermal accounts for 0.8 million, which cumulatively makes 40% of total manpower employed.[18, 19, 31]

VI. IMPACT ON SOLAR ENERGY

COVID 19 pandemic has created worldwide disruption across industry including solar energy sector. Most likely while the utility-scale installation impact will primarily see timelines shift, industrial, commercial and residential installation planning will struggle as customers come under significant economic pressure even past the lockdown.[30]

The major constituents of solar electricity generation are solar photovoltaic modules and solar inverters which almost cost 65-75% of total cost and are mostly dependent of Chinese imports.

The manufacturing of solar photovoltaic cells and modules and inverters are skills based with most of the companies are operating with decent manpower strength.

Installation and commissioning of solar electricity generation system are labour intensive.

Unlike impacts on other sectors, solar energy electricity generation sector has different sets of impacts which are as follows-

VI.I. Import Factor

Majority of solar equipment manufacturing industries in china were also hotbeds of COVID 19 pandemic. Fortunately those areas were opened in early April, 2020.

The lockdown in China was never on complete country and lockdown in other parts were opened where as other world's lockdown opening is going to be over 2/3 months which shall result huge inventory burden.

China till Feb. 2020, announce huge capacity addition on solar cell and panels. This was in anticipation of current planned cap addition of 142 GWp and future.[20]

Solar component manufacturing plants in China were working on low capacity utilization, pre COVID 19 scenario.

Anticipated worldwide recession and low revenue collection shall force government across the world to cut spending on renewable to some extent and divert fund to medical industry.

From 2017 level, own consumption in China shall be lower than 50GW, so companies shall be forced to export.

China lost its goodwill during COVID 19 pandemic and shall offer various incentives to different government and buyers to gain confidence.

Anticipated lower than expected growth in future due to implementation of newer technology, shall force them to push their product to cost conscious and profit hungry buyers like us.

China needs to bounce back in FY2020, Q3 to maintain its projections, which shall force them to sell their products aggressively.

VI.II. Localize Factor

Components like module mounting structures, wires & cables, minor electrical components are mostly manufactured locally and impact on balance of system of a solar photovoltaic electricity system shall be minor because the cost weightage is hardly 15-20%.

Installation and commissioning are labour intensive jobs and are carried out with local labour. As the plants are installed on various outside locations, labours and technicians are always in relocations.

VI.III. Government, non government and other procurement agencies

In developing countries, governments are big buyers of solar photovoltaic systems, which unfortunately shall be suffering from heavy liquidity crunch. The available funds shall be diverted for medical & public health policies which mean funds available for solar photovoltaic systems shall be low.

Unfortunately developed countries are worst hit by COVID 19 pandemic and this pandemic has exposed their inability to cope up these disasters.

Industrial units which uses solar photovoltaic systems for their reduction in electricity bill and other proven factors shall delay their rollout plan with solar photovoltaic systems because they shall be struggling to maintain their top line and bottom line healthy and minimize the loss.

Funds with non government agencies (foreign aid, NGOs etc) shall either shall be dry due to their donor's financial condition or diverted towards medical and public health segments.

Possibilities of additional taxes and duties imposed by government are not ruled out on several products and services and that shall have adverse effect.

Government push for more localization for their own goal of self sufficiency may lead towards hurdle on imports and prices pushing northwards.

Compliance to forthcoming personal safety standards and its cost of implementation shall push the cost of solar power system costly.

Not much effect by non Chinese supplies as they go to very specific customer or requirements and the quantum is low.

VII. SUMMARY AND CONCLUSION

Effective handling and management of future epidemics and pandemics requires a global effort with immediate sharing of knowledge and available resources.

The unfortunate outbreak of COVID 19 pandemic has impacted severely to global economy and developed countries are worst affected. Solar energy generation sector is also not untouched.

The uniqueness of solar energy generation sector is its high dependency on Chinese supplies which lately added huge capacity addition for their own consumption as well as worldwide supplies.

On optimistic side, if the pandemic is content within Q1, 2020, the revival of solar energy generation sector is possible within Q3, 2020 where as if it takes more time, the revival shall take much longer time due to fund crunch and possibilities of several companies windup and creating a cascading effect.

Fastest revival is possible if governments provide strong stimuli for this sector which is likely because of several inherited benefits of solar energy.

This study provides some of the first hand systematic information on how the COVID 19 pandemic affecting the solar energy generation market with several assumptions and post COVID 19 scenario.

It is concluded that despite hardship of man and supplies, the situation shall improve very fast and business shall not affected at all.

Future research and analysis can continue exploring how the pandemic affects various sectors with different methodologies, processes and approaches.

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