

July 2017

  
**samvad**

# **SOLAR BUSINESS**

## **Featured Article**

**Is Solar power the next  
Superpower?**



**WeChat**  
**Mr. Nagesh Sayam**  
**DGM- Strategy &**  
**International Business**  
**ReNew Power Ventures Pvt.**  
**Ltd.**

## ABOUT US



### OUR VISION

**“To nurture thought leaders and practitioners through inventive education”**

### CORE VALUES

**Breakthrough Thinking and Breakthrough Execution**

**Result Oriented, Process Driven Work Ethic**

**We Link and Care**

**Passion**

*“The illiterate of this century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.” - Alvin Toffler*

At WeSchool, we are deeply inspired by these words of this great American writer and futurist. Undoubtedly, being convinced of the need for a radical change in management education, we decided to tread the path that leads to corporate revolution.

Emerging unarticulated needs and realities need a new approach both in terms of thought as well as action. Cross disciplinary learning, discovering, scrutinizing, prototyping, learning to create and destroy-the mind’s eye needs to be nurtured and differently so.

We school has chosen the ‘design thinking’ approach towards management education. All our efforts and manifestations as a result stem from the integration of design thinking into management education. We dream to create an environment conducive to experiential learning.

## MESSAGE FROM THE DIRECTOR

Dear Readers,

It gives me great pride to introduce SAMVAD's edition every month. Our SAMVAD team's efforts seem to be paying off and our readers seem to be hooked onto our magazine. At WeSchool we try to acquire as much knowledge as we can and we try and share it with everyone.



**Prof. Dr. Uday Salunkhe**  
Group Director

As we begin a new journey with 2017, I sincerely hope that SAMVAD will reach new heights with the unmatched enthusiasm and talent of the entire team.

Here at WeSchool, we believe in the concept of AAA: Acquire Apply and Assimilate. The knowledge that you have acquired over the last couple of months will be applied somewhere down the line. When you carry out a process repeatedly it becomes ingrained in you and eventually tends to come out effortlessly. This is when you have really assimilated all the knowledge that you have gathered.

At WeSchool, we aspire to be the best and to be unique, and we expect nothing but the extraordinary from all those who join our college. From the point of view of our magazine, we look forward to having more readers and having more contributions from our new readers.

SAMVAD is a platform to share and acquire knowledge and develop ourselves into integrative managers. It is our earnest desire to disseminate our knowledge and experience with not only WeSchool students, but also the society at large.

Wishing everyone a very happy and prosperous new year.

**Prof. Dr. Uday Salunkhe,**  
Group Director



## FROM THE EDITOR'S DESK

Dear Readers,

Welcome to the July Issue of SAMVAD for the year 2017!

SAMVAD is a platform for “*Inspiring Futuristic Ideas*” and we constantly strive to provide articles that are thought provoking and that add value to your management education.

With courses pertaining to all spheres of management at WeSchool, we too aspire to represent every industry by bringing you different themes every month. We have an audacious goal of becoming the most coveted business magazine for B-school students across the country. To help this dream become a reality we invite articles from all spheres of management giving a holistic view and bridge the gap between industry veterans and students through our WeChat section.

The response to SAMVAD has been overwhelming and the support and appreciation that we have received has truly encouraged and motivated us to work towards bringing out a better magazine every month. We bring to you the July Issue of SAMVAD which revolves around the theme of “Solar Business”.

We hope you **read, share and grow** with us!

Hope you have a great time reading SAMVAD!

Best Wishes,

Team SAMVAD.

*“The difficulty lies not so much in developing new ideas as in escaping old ones.”*

John Maynard Keynes.

## ACKNOWLEDGEMENT

Team SAMVAD would like to extend their heartfelt thanks to certain key members of the WeSchool family for their special efforts towards the making of this magazine.

We deeply appreciate the constant motivation & encouragement that our beloved **Group Director Prof. Dr. Uday Salunkhe** has always extended. His focus on the core values of Passion, We Link & Care, Result Oriented Process Driven Work Ethic and Breakthrough Thinking has formed the foundation of all the activities that we undertake as students of this esteemed institute.

We deeply appreciate the help and support given to us by;



**Prof. Deepa Dixit**

Associate Dean-Global Alliance Assistant  
Head - Marketing Communication



**Prof. Jalpa Thakker**

Professor



**Prof. Rutu Gujarathi**

Senior Manager- Alumni Relations



**Prof. Priya Godbole**

Manager- Organisation Interface  
Multi-Stakeholder Engagement



**Ms. Yashodhara Katkar**

General Manager – Liaison



**Ms. Shilpa Kadam**

Assistant Manager  
Business Development

*Thank You*

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# WE CHAT

## MR. NAGESH SAYAM

DGM-STRATEGY & INTERNATIONAL BUSINESS, RENEW POWER VENTURES PVT LTD

### Team SAMVAD

#### Could you please take us to your journey?

As a mechanical engineer, I worked for about 3 years in the power sector in the thermal generation space. Then I pursued MBA from Welingkar, specialising in finance. This was in 2009, when the MW scale renewable sector in India had been picking up. Thereafter, I joined a company called CLP, which was predominantly into thermal generation in India. I had few other opportunities in hand both in the thermal and renewables side of the power business. I took a plunge, chose the latter and I think it paid off. While at that point in time, it was a bit of a leap of faith as the industry was really small compared to thermal energy. To be precise the total installed capacity of renewable energy to the entire energy generation capacity of the country was only about 9% then, as compared to 17%(excluding hydroelectricity) today. To give you a sense of numbers, out of ~352000 MW, almost 57000 MW comes out of renewable sources.

As I look back now, I am very proud of the decision. I joined the company when it had only 100 MW of installed wind energy capacity as part of its renewable portfolio. In about 7 years of my stint with CLP, we grew from a small team of 3 people with assets valuing at \$100 million to a \$1 billion investment, only in the renewable space.

Then I moved to my current company which is much younger and backed by Goldman Sachs, ReNew Power. It is the fastest growing Renewable Energy Company in India. From its inception in 2011, it has grown to become a \$2.5 billion company with 2300 MW of wind and solar projects operational in India. Another 1000 MW under construction. The journey has changed for me again as now I also focus on international markets as compared to a purely strategy profile



earlier because ReNew has taken a leap and aims to grow its business abroad as well. The journey so far has been fabulous. I've seen the ups and downs of the industry for over a decade now and been a part of the entire renewable energy journey of India ever since.

#### At what stage is the renewable energy industry in the country?

In early 2016, India signed the COP21 pact in Paris. According to the pact, our target as a country is to achieve a non-fossil fuel based generation of up to 40% of the total energy generation in the country by 2030. This can be achieved through all clean energy sources such as renewable, nuclear and natural gas. Keeping this in mind, the new Government has set an ambitious target of generating 175 GW of energy through renewable sources by 2022. Currently, we generate about 57 GW, which is less than 1/3rd of the target capacity. This gap needs to be filled in the next 5 years, which means every year we must at least add 24 GW capacity. It is a very impressive target and may seem aspirational but if we can achieve even 60-70% of the targeted capacity, it would be noteworthy.

The Renewable energy market in India is very competitive compared to the traditional power market because the tariffs are at par with the tariffs provided by conventional power sources. The competition has brought the solar tariffs in the range of 3.5 cents which is INR 2.44/unit, by far the lowest tariff from any thermal source of energy in India.

However, one of the biggest challenges faced by the industry is the insufficient evacuation network in the grid that enables only a minimal power output. Another issue is the financial health of the state-owned distribution companies that buy this power generated. The one intrinsic issue renewables industry has been trying to mitigate- is the intermittency of this power... This has led to some technology innovations to ensure stability and thus catapult this source into the mainstream.

### **How do government initiatives aid in the adoption of solar energy?**

As a country, when we started in the renewable energy space, it was an incentive-driven industry where one would be incentivised for investing in these projects. Businesses would be given either generation-based incentives, fixed feed-in tariffs, Tax sops, accelerated depreciation benefits etc. These benefits acted as a launch-pad for the industry.

However, with a view that the renewable energy industry is matured now most of the incentives have been dissolved by the government. Nevertheless, government programs like The National Solar Mission and International competitive auctions for wind and solar industry can offer a significant capacity addition in this sector.

However, some key enablers for the growth of the industry include strengthening power evacuation infrastructure, provision for deemed generation during grid non-availability, improving financials of the state-owned distribution companies to ensure timely payments to generators, increasing

number of competitive auctions to achieve the 175 GW capacity etc.

### **How can solar energy revolutionize businesses in India?**

In fact, it has already started revolutionising businesses. Although the total installed capacity today is still around 14000 MW, much smaller by foreign standards, last year the capacity addition for solar alone was 5800 MW

In fact, due to the distributed nature of the Solar energy it has potential to penetrate to people staying in remote villages across the country. Solar energy based electricity can be harnessed from anywhere in India without laying long power evacuation lines unlike other sources of electricity. Seeing the benevolence of this distributed generation against grid productions at the grassroot level, the government is encouraging such distributed generation projects by formulating policies that act as catalysts.

However, true revolution will begin when we make solar and wind energy source mainstream, by overcoming the issues of intermittency. Therefore, developing hybrid systems is key to energy revolution. Systems where day time power is generated by solar energy and in the evenings wind energy may be used with intervals filled in by battery backups, ensuring stable baseflow generation. Such a revolution may prove to be very beneficial for businesses in India.

### **How and by when can Indian solar energy industry be at par with its foreign counterparts?**

If you were to ask this question a year or two back, I would've said we have a long way to go. However, today I believe we are already there. For example, if you look at the solar tariffs in India of around 3.5 cents and compare it with some of the recent international auctions let's say in middle-east, where winning bids stood in the range of 2-2.5 cents, we are very close. This 1 cent difference also I believe is due to comparatively higher radiation in middle-east and lower financing



costs compared to India. The reason I emphasize on tariffs because consumer price-sensitivity and affordability impact the large-scale acceptance of this source of energy. Therefore, tariffs are a good indicator of the Indian growth story in comparison to its foreign counterparts.

From an international standpoint, we are behind countries like USA, China and Japan because they were early movers in setting large RE targets. Last year, of the Global solar capacity addition of around 80000 MW and wind capacity addition of around 55000 MW, our contribution stands at around 10000 MW.

India has a potential wind energy capacity of over 300000 MW due to its long coastline yet we harnessed only 10% of this. Similarly, pretty much the whole of India has Solar electricity generating potential. We must thus, work on capitalising on such natural resources and increase our base to achieve our ambitious target by 2030.

### **What advice would you like to give management students who want to pursue career in this industry?**

Even as a student, I was an energy enthusiast and aspired to be in the industry. Often, I would speak to Prof. Salunkhe about starting an Energy vertical. Today, I feel the time is ripe to actually put in action those ideas and I'd be more than happy to lend my support to it because a lot of awareness needs to be increased. Students must remember this is a very technical space. Therefore, it is vital to understand the technology as well as the business.

We are in fast-paced ever changing world. In fact, even at ReNew we have an in-house technology team that only focuses on conversion of new technologies into commercial ideas. Business cases can be made and pitched to companies like us, with either a competitive or recruitment view in mind. Welingkar has a great innovation incubator, where you can initiate projects on hybrid solar, floating solar, storage solutions etc. You can also have conversations in forums on how India can optimise the usage of natural

resources, converting new technologies into business ideas.

What you bring on the table as a fresh management graduate is the business acumen along with the technical knowledge. If you need an entry into this market, such projects and thorough study on the industry will give an edge and your ideas will be taken more seriously.

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# OPERATIONS

## THE FUTURE OF SOLAR POWER

*Nidhi Sachdev, PGDM E-business, (2016-18), WeSchool, Mumbai*

### Overview

Solar Business worldwide has great political support. Even during the recession period many governments provided funding, subsidies and tax benefits. Leading nations are Germany, Italy, France, China, USA, Canada, India etc. The threat of climate change and obligations to reduce Green House Gas (GHG) emissions has put onus on each large country, including on India, to support renewable energy power generation vigorously.

In India., out of total installed capacity of about 145000 MW, about 12500 MW is contributed by Biomass, Small Hydro, Wind and Solar energy. The nodal Ministry, MNRE, is proposing a new policy under “Solar Mission” already approved by Prime Minister of India, to introduce big incentives by way of low rates of interest (under 4% on Indian Rupee loans), high tariffs for Solar Power Generation Plant, Tax and Duty exemptions, capital subsidy etc.

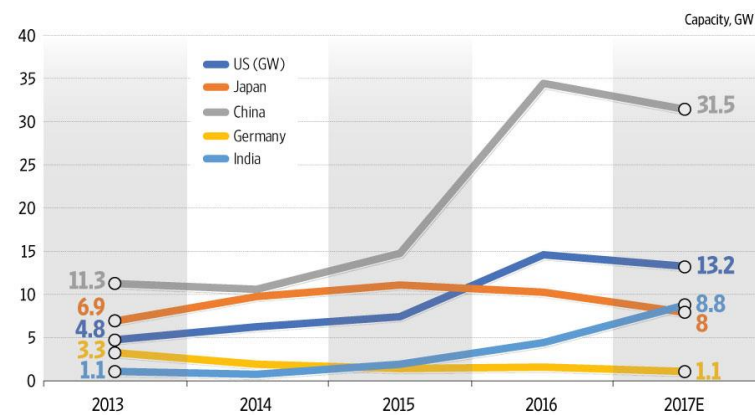
### The International Solar Market

Globally, new solar capacity addition grew to 50 GW in 2015, y-o-y growth of 25%. Asian countries led by China and Japan dominated the global solar landscape, representing about 59% of the global PV market in 2015. India added more than 2 GW capacity in 2015 to reach a cumulative capacity of 5.6 GW by the end of the year. This allowed India to rise to the eighth position for total installed capacity repetition as of December 31, 2015.

Solar market in the Americas also continued to grow with the USA, Canada and Chile leading the pace but Europe, which had previously led the

way for the solar industry globally, has seen growth stall in recent times because of the pull back of the FiTs.

### CAPACITY ADDITION IN LEADING INTERNATIONAL MARKETS



Source: <http://www.livemint.com/Industry/gU7aHwYKlhmQGASjSqiavN/India-to-be-third-largest-solar-market-in-2017-report.html>

The solar industry is growing up to become a sustainable and profitable business that is less reliant on government support.

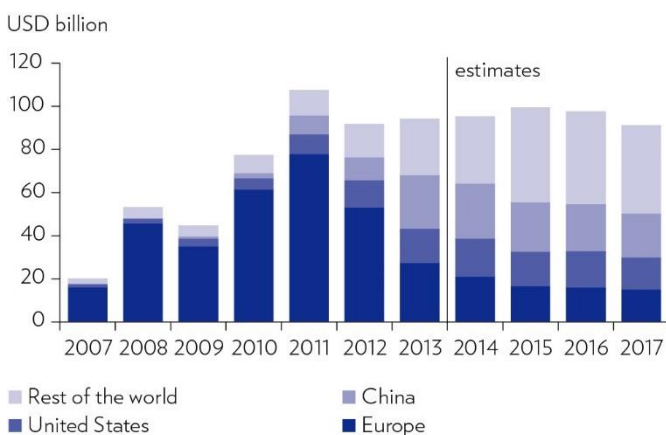
### Solar Energy is fast becoming a very competitive space

Improved technology and mass production have led to a 60% drop in solar module prices over the past three years. While global government subsidies still provide the basis for a flourishing solar market, for the first time in history solar technology is becoming economically competitive. Put into context, global solar installations surged from 15 gigawatts in 2010 to almost 40 gigawatts in 2013 – or roughly the equivalent of 40 average-sized coal or nuclear power plants.

## China leads regional growth prospects

While we expect solar energy to soon compete with conventional power generation costs, taking a leading role in energy markets, we have to consider that industry growth varies from region to region.

This is due to available sunlight and differences in government subsidies, wholesale/retail channels and installation/financing costs. In fact, China offers the greatest solar growth prospects of the world. Chinese reform allows for attractive feed-in tariffs and residential installation fees, with an ambitious new target of 70 gigawatts – up from 45 gigawatts in 2014 – of installed solar capacity by 2017, which would translate into average yearly installations of 14 gigawatts over the coming years.



Source: Julius Baer (total system revenues)

## The Indian Solar markets

The Indian Solar market is at a full boom stage but what is holding it back is the financial difficulty that it poses. With 8.8 gigawatt (GW) of capacity addition projected for the year ahead, India is set to become the third biggest solar market globally in 2017, overtaking Japan, according to the India Solar Handbook 2017 released by Bridge to India (BTI) on Monday.

The report by BTI, a consulting firm in India's clean technology market, said solar capacity in the country is expected to touch 18.7GW by the end of 2017, which is about 5% of global solar capacity.

As of March 2017, India had installed 12.2GW of utility scale solar. In June 2015, the government had revised India's solar power target to 100GW from 20GW, by 2022.

The report said the "total new solar capacity addition in the next five years is expected at 56GW". This, however, implies that India would fall short of its 100GW target.

According to the BTI report, about 79GW of solar capacity is expected to be added globally in 2017, with Asian countries continuing to dominate the industry while Europe continues to fall in rankings

### CAPACITY ADDITION IN LEADING STATES

Gujarat	Maharashtra	Punjab	Andhra Pradesh	Rajasthan	Tamil Nadu	Telangana	Karnataka	Madhya Pradesh	Uttar Pradesh	Others/State (MW)
15	1	2					6			4
117	18	4	10	53	2	1				18
823	25.6	11.5	20	213	11	6	14	11.6	14	55.3
868.7	230.15	16.5	65.15	688.9	45	30	41	247.2	19	71.3
930.65	322.5	59.5	136.35	906.1	115.3	143.8	74	402.7	31	94.8
1024.95	398.1	202.75	176.7	1296.6	349.983	314.05	129	686.2	123.1	275.05
1111.85	411.47	704.75	1030.25	1326.6	1583.4	1022.65	515.5	855	229.6	521.7
1281.85	963.57	855.75	2900	2126.6	1755.4	2764	1545.5	1380	759.6	721.7

Source: <http://www.livemint.com/Industry/gU7aHwYKlhmQGASjSqiavN/India-to-be-third-largest-solar-market-in-2017-report.html>

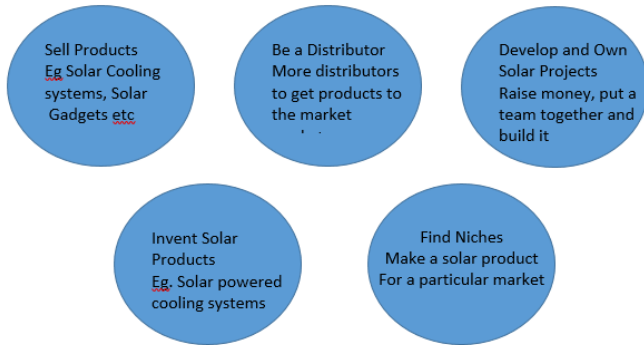
In India, the states of Tamil Nadu, Andhra Pradesh and Telangana have emerged as the fastest growing in terms of solar power capacity addition. In 2017 nearly 60% of total new capacity addition is expected to come from the southern states.

"Indian solar market has grown by an average 72% in the last three years and is now worth approximately 8-9GW per annum. Growing market size and strong government commitment to the sector have attracted the world's leading private sector players as well as resulted in lower tariffs for consumers. As the sector matures, however, there is a formidable new challenge arising in the form of how to absorb rising share

of intermittent energy into the grid,” said Vinay Rustagi, managing director of BTI.

## Solar Business Opportunities

There are various opportunities that the solar business opens to the world. Naming a few:



## Future of solar power

Within the next 30 years, the International Energy Agency predicts that solar energy could count for up to 16% of the globe's entire energy. As it stands, it generates 1%. However, analysts have been critical of this optimistic growth potential, citing that it would only be possible if governments change their policies concerning solar energy.

Even in countries where the solar energy industry needs subsidies to operate (such as the United States), costs are getting cheaper. This has sparked American utility companies to enter into 20-year agreements to purchase solar power at prices roughly 5 cents per kilowatt-hour – in some instances even lower. These price points are in some cases low enough to compete with electricity generated from natural gas, an American staple. If gas prices rise in the future, which is not an unlikely scenario, solar will be that much more competitive.

China still leads the global solar-panel manufacturing market. Estimates released last year (according to HIS Market), China produced 70% of the globe's capacity for crystalline-silicon solar panels which is the most popular type. That year, the United States accounted for 1%.

The moment for the US to act, however, is ever approaching. China is now innovating in the solar panel space, whereas before, they simply replicated existing technology at lower costs. Their advancements are creating more efficient ways to transition energy from the sun into electricity, and they are attempting to expand their breadth across the world. American policy makers need to account for this so that the cost of solar power is minimized while also benefiting the American economy.

From 2030, solar would begin to side-line coal in India, with the pace of photovoltaic (PV) additions more than doubling from the 2020s to the 2030s, said the New Energy Outlook-2017 by BNEF.

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# FINANCE

## GROWING IMPORTANCE OF SOLAR BUSINESS IN THE INDIAN SCENARIO

*Jaikishan Kankani, MMS 2016-18, WeSchool, Mumbai*

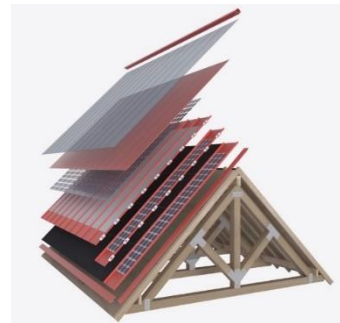
Everyone has used a magnifying glass to light up a paper in their childhood by holding it against the sun. At that time, we were in awe thinking 'Wow, that's awesome!' That's one fond memory of our childhood has made us understand that our sun is so powerful and mighty. Today, in 2017, we now hear and see many amazing developments in solar business.

The history of use of solar energy dates back to start of mankind. But it was in 1839, that Alexander Edmond Becquerel discovered that certain materials can be used to produce electricity by directly exposing it to sunlight. This major discovery of this great man is what is today helping us to cope with our ever-increasing demand for energy and electricity.

Today, the prime example of funding and returns from use of solar energy is the Tesla Gigafactory-1 set up by Elon Musk in Nevada, USA. The Gigafactory-1, the cost of which is \$5 billion, received the first funding from Panasonic in 2014 of about \$1.5 billion - \$2 billion. Also, Tahoe-Reno Industrial Centre, popularly known as TRIC gave 1000 acres of land to Tesla for its Gigafactory-1. Even the state of Nevada has given incentives of \$195 million in transferrable tax credits, 20 years sales tax holidays, and 10 years of property tax holidays.

Also, Tesla has introduced Tesla Solar Roofs, thatched roof tiles (with lifetime warranty!) the cost of which is lower than the normal roof tiles as well. These differ than others in the way that these have solar panels and can power a whole house. And with the eventual ROI growing Y-o-Y, this seems like a viable option which is also cost effective. Also, the investments in the solar roofs

segment is increasing and the competition is heating up. Forward Labs, a Palo Alto based start-up has developed another type of solar roofs which it says is 33% than Tesla's Solar Roofs. Though it has been self-funded by the founders, the company is on an expanding stage and will soon require funding.



In May 2017, EY in a report mentioned that India has surpassed USA to be at 2<sup>nd</sup> position as the most attractive renewable energy market, with solar sector being at the top. This is majorly after PM Narendra Modi ascended to power and said that solar energy is 'the ultimate solution' to India's energy crisis.

First renewable energy conference was held in India in 2015, where private companies committed about \$200 billion in investments in green energy in India. The government now allows even 100% FDI under direct route and 74% of foreign equity participation in a joint venture in Indian solar sector. Because of this the initial commitment of \$200 billion by private players has increased to approximately \$310-350 billion wherein around 293 global and domestic companies are involved. This will help in generating about 266 GW of renewable energy within 5-10 years.

According to an article on vikramsolar, SBI has signed an agreement with The World Bank of \$626.3 million for providing better credit facilities for financing of Grid Connected Rooftop Solar Photovoltaic (GCPV) projects in India. The

World Bank has even committed \$1 billion for further support and development of India solar industry. Also, one more major agreement was signed by The Ministry of New and Renewable Energy (MNRE) with KW Development Bank of Germany to improve the floating solar projects in Maharashtra, Kerala, and other potential states.

In 2015, many PE and M&A deals took place in India in the solar space with PE investing around \$41 million alone in that year in Applied Solar Technologies (India) Pvt. Ltd., Sun Terrace Energy Pvt. Ltd., and Ecozen Solutions Pvt. Ltd. And Mergers took between Havells India & Promptec Renewable Energy Solutions for \$532 million, Surana Telecom and Power & Arhaya Energy Pvt. Ltd. & Tejas India Solar Energy Pvt. Ltd. for undisclosed amounts; one major Cross border acquisition that happened that year was of SunEdison Inc. which was acquired by TerraForm Global Inc. for \$231 million.

## DEAL TRACKER

Major private equity and M&A deals that took place in the solar space in 2015.

### PE INVESTMENTS

Investor	Investee	Seller	Sector	Stake (in %)	Deal value (in \$ mn)
Future Fund, Bessemer Venture Partners (BVP), Capgem Investment Group and World Bank Investment arm International Finance Corp. (IFC)	Applied Solar Technologies (India) Pvt. Ltd. (AST)	N.A.	Energy and natural resources	N.A.	40
Sunergy Investors LLC	SunTerrace Energy Pvt. Ltd.	N.A.	Energy and natural resources	N.A.	N.A.
Omnivore Partners	Ecozen Solutions Pvt. Ltd.	Villgro Innovations Foundation	Manufacturing	N.A.	1

### M&A TRANSACTIONS

Acquirer	Target	Seller	Sector	Deal value (in \$ mn)	Deal type	Stake (in %)	Domestic/Crossborder
TerraForm Global Inc.	SunEdison-Indian solar power plant	SunEdison Inc.	Energy and natural resources	231	Acquisition	100	Inbound
Havells India	Promptec Renewable Energy Solutions	Blume Ventures and other angel investors	Manufacturing	532	Majority stake	51	Domestic
Surana Telecom and Power	Arhaya Energy Pvt. Ltd.	N.A.	Energy and natural resources	N.A.	Majority stake	51	Domestic
Surana Telecom and Power	Tejas India Solar Energy Pvt. Ltd.	N.A.	Energy and natural resources	N.A.	Majority stake	51	Domestic

Source: Grant Thornton

And while India's solar energy potential has been tapped under 1% (as of 2015), the rapid growth it has seen has resulted in generating 10 GW of energy in Q1 2017, and also, it has made the 100 GW solar energy generation in India more tangible than ever.

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<http://indianexpress.com/article/technology/science/indias-solar-energy-potential-still-under-one-percent-study/>

<https://www.digitaltrends.com/cool-tech/solar-roof-cheaper-than-tesla/>

<http://news.energysage.com/tesla-solar-panel-roof-the-next-solar-shingles/>

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While the solar energy sector is seeing a tremendous boom, it is also facing a handful of issues. Some of these issues include land availability, challenges around evacuation of power, lack of established and professional Operations & Maintenance players, aggressive tariffs, etc. Another issue is that the ROI in solar sector is slow. The companies and private investors need to stick in for a long haul. For e.g. IFC has been investing in India in Wind and Solar Energy since 2009. While it has invested about \$700 million in these sectors, which includes \$340 million funding from external sources, it says it has started to earn some substantial returns since 2013-2014. This would have been a long period if private investment was concerned.

# MARKETING

## IS SOLAR POWER THE NEXT SUPERPOWER?

*Ameya Shukla, PGDM - Research and Business Analytics (2016-18), WeSchool, Mumbai*

A lot has been written, said and talked about solar power recently. This is in part because of, Mr Narendra Modi, (hon. Prime Minister of India) who with his 'Make in India Campaign' has promoted solar energy extensively from the start of his term. Renewable energy resources as a whole have been promoted, but recently, somehow solar energy has received more attention than others. The Orwell quotation 'some are more equal than others' seems to hold true in case of clean power sources too. Solar energy is undeniably more equal than wind energy or nuclear energy. One may ask, why this discrimination. In the larger scheme of things, what makes solar energy a citizen and other clean energy sources (including Nuclear energy) just common plebeians.

Let us consider few statistics and figures and in the end come up with specific insights if not a specific answer to the hypothesis 'Is Solar Power the next power?'

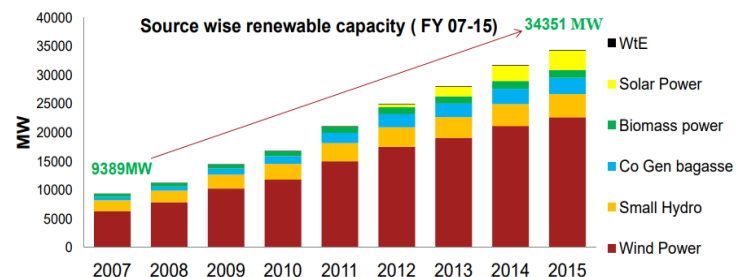


Figure 2

In 2007 solar power didn't even seem to exist, but in 2015 it has managed to gain a considerable share.

Targets predicted by the Indian government for 2022 are given in the table below [1]

	Capacities in MW	
Year	2015	2022
Solar	4,879	1,00,000
Wind	25,088	60,000

Thus, by 2022 we can expect solar to cross wind and become the biggest player in renewable energy resources. The above stats thus make it clear that solar energy has seen a tremendous growth as compared to wind energy. The tremendous growth is due to many factors. Some of them are:

- Windmills require huge land spaces to install. Whereas, solar installations can also be done at a small-scale level.
- The fall in the price of solar equipment have made solar energy cost effective. Wind Energy continues to remain very costly.

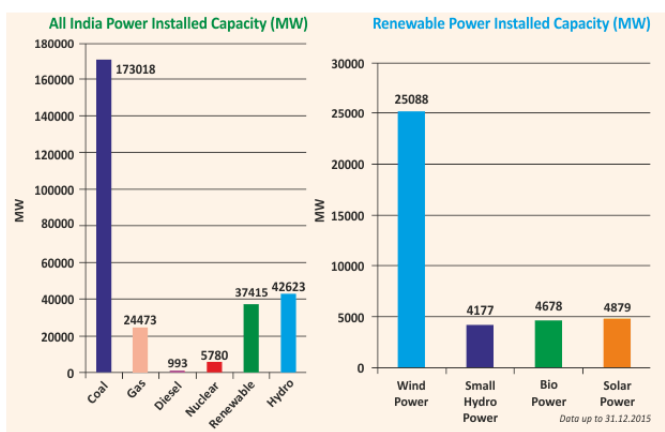


Figure 1

Figure 1 shows us the overall power installed capacity and renewable power installed capacity. Figure 2 shows us year wise distribution of renewable power installed capacity.

- Maintenance cost of solar equipment is really low as compared to maintenance cost of wind turbines.

The other major competitor to solar energy is nuclear power. But the same logical arguments which went against wind energy also go against nuclear energy. The ROI of nuclear energy compared to solar energy is really low. In addition to this, the consistently falling solar energy prices has made other clean sources almost redundant. In fact, solar energy is now cheaper than even thermal energy, thereby undercutting even fossil fuels!

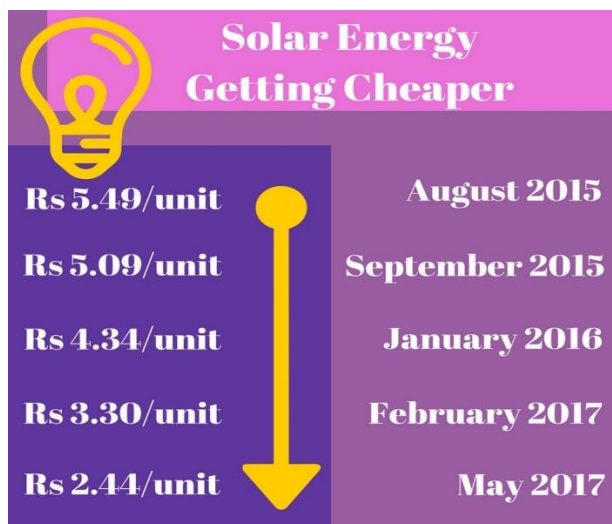


Figure 3

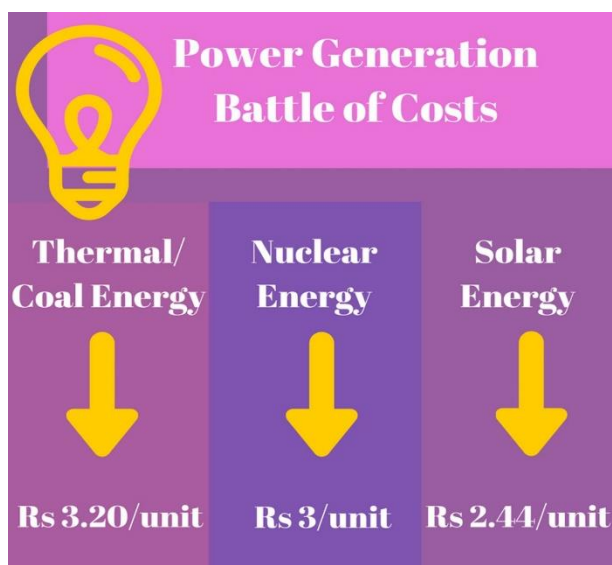


Figure 4

Figure 3 and Figure 4 make it clear that the collapsing cost of solar electricity in India is beyond expectations, and the results are now in, solar has won.

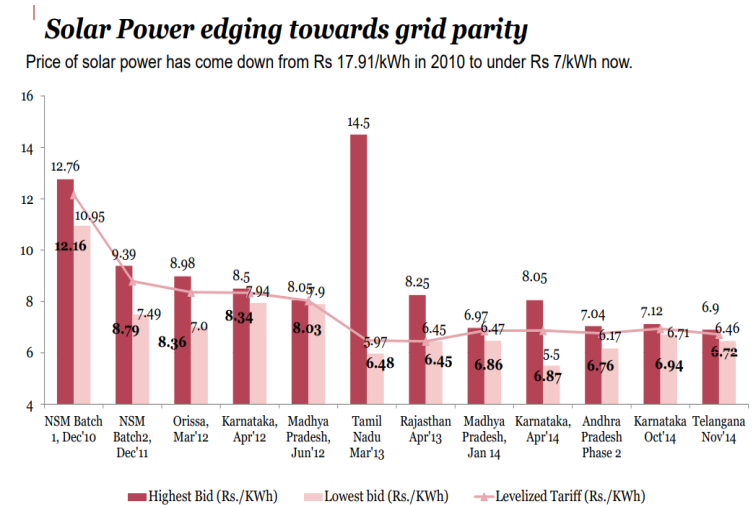


Figure 5

How the pricing works is that, the government routinely organises auctions where tenders to generate solar energy from solar parks are given. They're open to both Indian and international companies who make competitive price bids and the lowest bidder wins. This is the price at which the companies sell power to power distribution companies. In today's solar market in India, almost every passing tender has promised to deliver cheaper electricity. The source of these gains is well recognised in the industry. Since 2010, over 7500 MW of solar power projects have been tendered and the winning tariffs have fallen by 58 per cent. If we peer further back to the regulated era, winning quotes now are less than one-third of the 2009 solar feed-in tariff rates. This fall in price has also put the country on track to meet renewable energy targets set out in the Paris agreement.



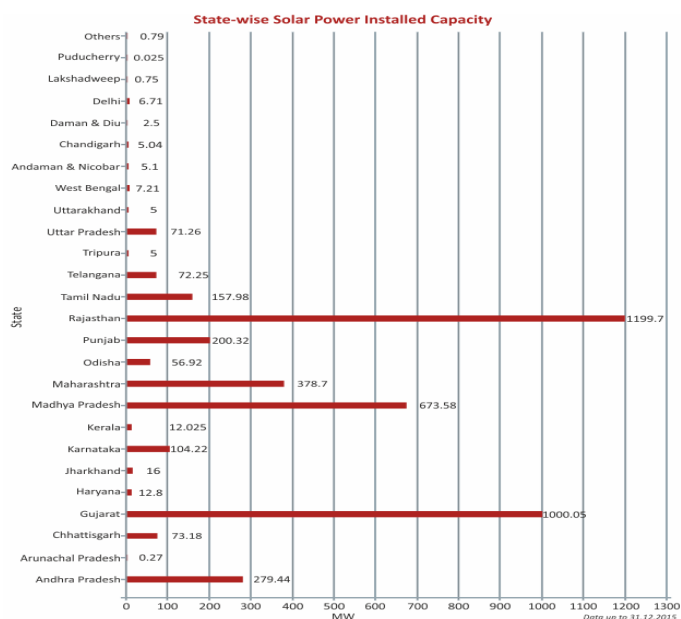


Figure 6 (State Wise solar installed capacity)

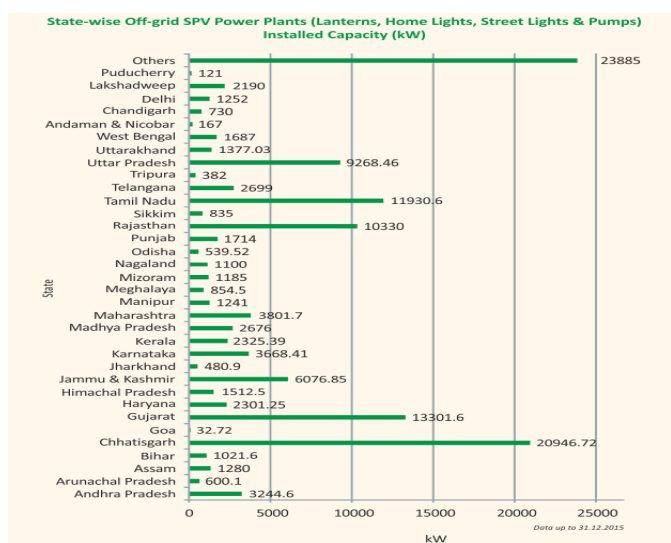


Figure 7 (State Wise off grid SPV power plants)

But all that the aforementioned data shows us is, 'Solar power is THE power'. It doesn't explain why. One of the major reasons that Indian government is pushing for solar power is that, India is densely populated and has high solar insolation. Both of them together are an ideal combination for using solar power in India. Another major reason is the relative ease of installing a solar panel. Villages which had no electricity just a year back, now have solar

electricity. Consider the example of Mr. Rameshwarlal Choudhary,

"Rameshwarlal Choudhary, a 45-year old farmer, and his wife Dakha, 40, live with their two children in a small shack near the village of Solawata in India's Rajasthan. Their home has thatched walls, a tin roof, and one side is completely open to the elements. Until six months ago, they were part of the 44% of India's rural households who lack electricity. Now, through a 40-watt solar panel perching on a tree branch outside the hut, they have enough power for three lights: one inside the house, one in the fields, and one on a tree above the roof. "With the extra light, we can study until 10 pm," says their daughter Pooja, a 17-year-old student. And her parents can farm and milk their cows beyond sunset - around 5pm for the first time. "The light also helps keep snakes, rodents, and scorpions at bay," says Ramjilal, their 20-year-old son who is also a student. "[2]"

Thus, advancement in solar technology has made it possible for individual homes to be powered by solar energy. There are many rural areas in India which are not covered by electrical grid, solar energy can be used to fill the gap in such rural areas. Solar products have increasingly helped to meet rural needs, by the end of 2015 just under one million solar lanterns were sold in the country, reducing the need for kerosene. That year, 118,700 solar home lighting systems were installed and 46,655 solar street lighting installations were provided under a national program, just over 1.4 million solar cookers were distributed in India. [3]. This is something which cannot be achieved by either nuclear or wind energy.

The Government of India understands this and hence has taken many initiatives to promote solar energy. From awareness (Theatre advertisements), different schemes (such as Jawaharlal Nehru national solar mission), to providing subsidies the government has shown keen dedication to achieve its target of solar

power installed capacity of 1 lakh MW by year 2022.

The above-mentioned whys and wherefores are just some of the reasons why India has embraced solar energy and also why we can claim to accept the hypothesis.

“Solar Power is the Next Superpower”.

#### References:

[1] Ministry of New and renewable energy resources (MNRE) report 2015-2016.

[2] Seeing the light: How India is embracing solar power By Padraig Belton.

[3] Seeing the light: How India is embracing solar power By Padraig Belton.

#### Image sources:

Figure 1] Ministry of New and renewable energy resources (MNRE) report 2015-2016.

Figure 2] Ministry of New and renewable energy resources (MNRE) report 2015-2016.

Figure 3] As Solar Energy Price Falls, Indian Manufacturers Lose to China by Aishwarya S Iyer.

Figure 4] As Solar Energy Price Falls, Indian Manufacturers Lose to China by Aishwarya S Iyer.

Figure 5] Ministry of New and renewable energy resources (MNRE) report 2015-2016.

Figure 6] Ministry of New and renewable energy resources (MNRE) report 2015-2016.

Figure 7] Ministry of New and renewable energy resources (MNRE) report 2015-2016.

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# HUMAN RESOURCES

## SOLAR BUSINESS AND ITS CONNECTION TO HR

*Tejal Shisode, PGDM-Business Design (2016-2018), WeSchool, Mumbai.*

A systematic manpower development effort in the Ministry was started in 1999-2000 for project planning, system design, product development, operation, maintenance and repair of deployed systems for the first time by way of introducing a scheme for renewable energy training and study tours with provision for organizing short duration training programmes of one to two weeks within and outside the country. A National Renewable Energy Fellowship Scheme was also instituted during 1999 – 2000. These schemes continue till 2007-08 in the same format. These schemes were reoriented to cater more manpower requirement in view of up gradation/reorientation of the programmes of the Ministry during the year 2008-09 with following provisions:

(a) Training of professionals working in the Ministry and its attached offices and autonomous bodies at specialized institutions in India and abroad;

(b) Training of professionals working in state Nodal Agency/Government/ Utilities on different aspects of technology, its development and project management;

(c) Training of manpower on social/economic, trade, legal trade, IPR, administration, managerial and environmental aspects;

(d) Training of the manpower working on various aspect of renewable energy with research & development institutions, NGOs, community based organizations, banking and financial institutions etc.

(e) Organization of training-cum-study tours.

f) Development of training modules including pedagogy through expert(s)/expert institutions.

Addressing long-term HRD needs: In order to gravitate students and professional in the field of renewable energy and also to prepare manpower through universities/technical institutions ready to work on various aspects of renewable energy, the following are also part of the scheme:

a) Enlarge coverage of renewable energy fellowship scheme by covering more universities/institutions and also R&D institutions, to conduct research on all aspects of renewable energy. This way the R&D programmes will not be limited only to a few technology institutions rather it will have larger spread across the country;

b) In order to address the curriculum needs of technical institutions to cover renewable energy, there is urgent need to develop model curricula for inclusion in the ITIs, diploma and degree course. The curricula and the course material so developed would be circulated to all such institutions through State Technical Education Boards and AICTE.

While the reoriented scheme has been fulfilling the short term requirement of manpower, for systematic and long term manpower requirement for renewable energy development in the country in the light of recent initiatives of the Government in the form of National Action Plan On Climate Change(NAPCC) and National Solar Mission clubbed with Renewable Purchase Obligation(RPO) of Electricity Act 2003 and recently announced Renewable Energy Certificate (REC) mechanism, it was thought necessary that an institutional framework is developed in existing educational institutions to

cater requirement of quality education and training in the field of renewable energy by these institutions. Therefore, new provisions have been Training of professionals working in the Ministry and its attached offices and autonomous bodies at specialized institutions in India and abroad;

1) Training of professionals working in state Nodal Agency/Government/ Utilities on different aspects of technology, its development and project management;

2) Training of manpower on social/economic, trade, legal trade, IPR, administration, managerial and environmental aspects.

3) Training of the manpower working on various aspect of renewable energy with research & development institutions, NGOs, community based organizations, banking and financial institutions etc.

4) Organization of training -cum -study tours; HRD During 11th Plan Organization of training -cum -study tour, Development of training modules including pedagogy through experts' /expert institutions, addressing long-term HRD needs. Energy Chairs in 15 higher educational institutions, providing grant-in-aid support for lab and library upgradation in educational institutions conducting renewable energy courses and increasing the number of fellowships under National Renewable Energy Fellowship Programme.

Solar energy and Human resource can term together for the betterment and for employing the people towards the solar energy. But yes, it's also true when we are engaging people towards the solar energy we need to look at the training and development is needed because engaging people into solar energy is not an easy task. If we motivate people and if a structured process is followed by any HR will be beneficial to any human being.

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# GENERAL MANAGEMENT

## SOLAR- THE LARGEST ENERGY SOURCE ON EARTH

*Mithilesh Mahadik & Ritesh Bhakre, PGDM (2017-19), IIM- Trichy*

A plunge in costs for solar technology coupled with an increase in electric utility rates has resulted in sunlight (photovoltaic-created) based power in being more affordable than grid power.

Be that as it may, for some individuals, it is still hard to put resources into solar. The normal American moves more than 11 times over their lifetime, and more than 33% of Americans lease lodging, which makes a 25-year interest in a housetop nearby planetary group testing.

Even in India, complexity of subsidy structure & involvement of too many agencies like MNRE, IREDA, SNA, electricity board and electricity regulatory commission makes the development of solar PV projects difficult.

India's DGAD has recommended the imposition of anti-dumping duties on the import of solar cells and modules from countries like U.S. By this, DGAD seeks to right an imbalance for India's local solar manufacturing industry. However, this prevents affordable access to solar technology that might be pioneering and more efficient.

Between 2008 and 2013, China's sun oriented electric board industry dropped world costs by 80 percent. China's turn overshadowed the administration of the U.S. sun oriented industry, which developed the innovation.

China's novel strength of almost all parts of sun based use and assembling—as per a recent Department of Energy report—got through a one of a kind, intricate and related arrangement of conditions that is not liable to be reappear.

The course of events of China's ascent started in the late 1990s when Germany, overcome by the

household reaction to a government program to incentivize advance housetop sunlight based boards, gave the capital, innovation and specialists to entice China into making sun oriented boards to take care of the German demand.

China, as indicated by Chung, had "fiddled" in solar energy as a means of power to help debilitated provincial zones remote from its energy network. And then few of its innovative companies were captivated by the income potential of assembling solar panels to ship to Germany. Later there was demand from Spain and Italy too and China rummaged the world for procuring more sun powered specialists and looking for hardware and polysilicon supplies to meet the normal surge of requests for sun based boards.

Expanding sustainable energy became one of seven categories of business that elicited particular interest under China's five-year plans.

As per Ronen, from George Washington University, China then followed into Germany's footsteps again, and devised its own "feed-in tariff" that paid substantially for rooftop based solar electricity. This precipitated was an increase in domestic demand for solar.

The demand was large enough to have China's domestic market bypass Germany's to be the largest in the world. The Chinese put the entirety of their governmental system behind solar modules manufacturing.

*Solar is by a wide margin the biggest energy resource accessible on Earth— sustainable or otherwise.*

All other energy sources—besides nuclear, geothermal, and tidal—come from sunlight. Fossil fuels are in a sense, solar batteries in that they are solar energy integrated over many eons using dinosaurs (and other carbon-based life forms). Wind and wave energy is nothing but solar energy absorbed across the Earth's terrain. Among low-carbon vitality sources, just sunlight based, wind, and perhaps atomic can come to the terawatt (TW)- scale deployment required to fulfil the ever-growing global energy demand (currently ~17 TW average).

*Solar photovoltaics are growing faster than any other energy technology.* Combined installed PV capacity worldwide has multiplied like clockwork (43% CAGR) since the year 2000, reaching ~200 gigawatts-top (GW) in 2014. This Moore's Law-like development will probably continue, though moderately, as naive extrapolation leads us to some untenable conclusions: If PV capacity were to continue developing at the present rate, sunlight based boards would fulfil all world power request within 10 years, cover the Earth by 2050, and shape a Dyson circle around the sun soon after 2100.

Environmental change is going on, we require loads of low-carbon energy to stop it, sun based is one of our only viable alternatives, and sun powered PV is growing faster than anyone ever envisioned.

To safeguard the future eras from the impact of harmful environmental change, we should optimally use solar and other renewable energy resources. The present innovations (crystalline silicon PV) can—and likely will—scale up to multiple terawatts of capacity worldwide by 2030 with no major technological advances.

The primary hurdle is cost: Global PV development up to this point has largely been driven by governmental and local subsidies. So, PV is now competing on the economic level aggressively with petroleum products at some places, and system costs keep on declining. Furthermore, despite the fact that present innovations will probably level at some base practical cost floor, it's clear that there are numerous new and energizing solar based

advancements in the pipeline, and they may become conventional with time.

Research in photovoltaic is rising quickly on many fronts. Some of these methodologies are still in the initial stage and far from being put into production, yet they may progress toward becoming standard later on.

A group at Stanford has made a model PV cell utilizing carbon nanotubes and fullerenes as opposed to silicon. Its productivity is far underneath that of even standard, commercially accessible silicon solar cells, yet it utilizes carbon as a raw material. The Stanford model contains none of the poisonous materials that frame some portion of the terminals in customary solar cells. It's all the more naturally agreeable option to silicon, yet regardless it needs to see its productivity ascend before getting to be economical.

There is no room of doubt that sun based energy will inevitably be a critical, if not the ruling, type of energy both on a mechanical and an individual scale. So, for the scientifically minded, one can only hope that the need to consume petroleum products declines before the worldwide atmosphere endures irreversible changes. Solar energy is the way forward for a cleaner, greener and sustainable future.

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<https://www.scientificamerican.com/article/why-china-is-dominating-the-solar-industry/>

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## NEWS CORNER

### Team SAMVAD

#### Solar Energy to Match Thermal by 2026

India's renewable energy programme is proceeding at such a rapid pace that its contribution to total power generation will equal that of coal in 2026 and surpass it the following year, according to projections made in the second volume of the Economic Survey released on Friday.



At present, India's installed power capacity is 327 GW of which

thermal power from coal comprises 192.16 GW or 55% of the total, while renewable energy capacity is 57.26 MW or 18% of the total. India has set itself the goal of 175 GW of renewable power capacity by 2022 and 275 GW by 2027. Source: inndaily.com

#### Consortium of Universities to Help Indian Villages

Twelve British and Indian universities have come together and have received a grant of seven million pounds from the UK government to build five self-sufficient solar-powered buildings in remote Indian villages.



The grant is part of a new solar project called 'SUNRISE'.

This project is aimed at developing printed photovoltaic cells and new manufacturing processes which can be used to make solar energy products in India.

These will then be integrated into buildings in at least five villages of India, allowing them to harness solar power to provide their own energy. Source: The Hans India

#### Haryana State Government launches Solar Mela

A Solar mela was organised on 12<sup>th</sup> and 13<sup>th</sup> August by the district administration and HAREDA which saw participation from 36 solar companies and 13 leading banks. The objective of this Mela was to educate the citizens about the solar energy and its economic benefit in the long run.

Haryana State government wants to engage in continuous awareness programs to bring Solar and other renewable energy in the limelight.

## CALL FOR ARTICLES

We invite articles for the **September** 2017 Issue of SAMVAD.

The Theme for the next month: **September** 2017 - “GROOMING/IMAGE CONSULTING”

The articles can be from Finance, Marketing, Human Resources, Operations or General Management domains.

You may also refer to sub-themes on Dare 2 Compete.

### Submission Guidelines:

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- Cover page should include your name, institute name, course details & contact no.
- The references for the images used in the article should be mentioned clearly and explicitly below the images.
- Send in your article in .doc or .docx format, Font size: 12, Font: Constantia, Line spacing: 1.05' to **samvad.we@gmail.com**. **Deadline for submission of articles: 25<sup>th</sup> September, 2017**
- Please name your file as: <Your Name>\_<title>\_<section name e.g. Marketing/Finance>
- Subject line: <Your Name>\_<Course>\_<Year>\_<Institute Name>
- Ensure that there is no plagiarism and all references are clearly mentioned.
- Clearly provide source credit for any images used in the article.

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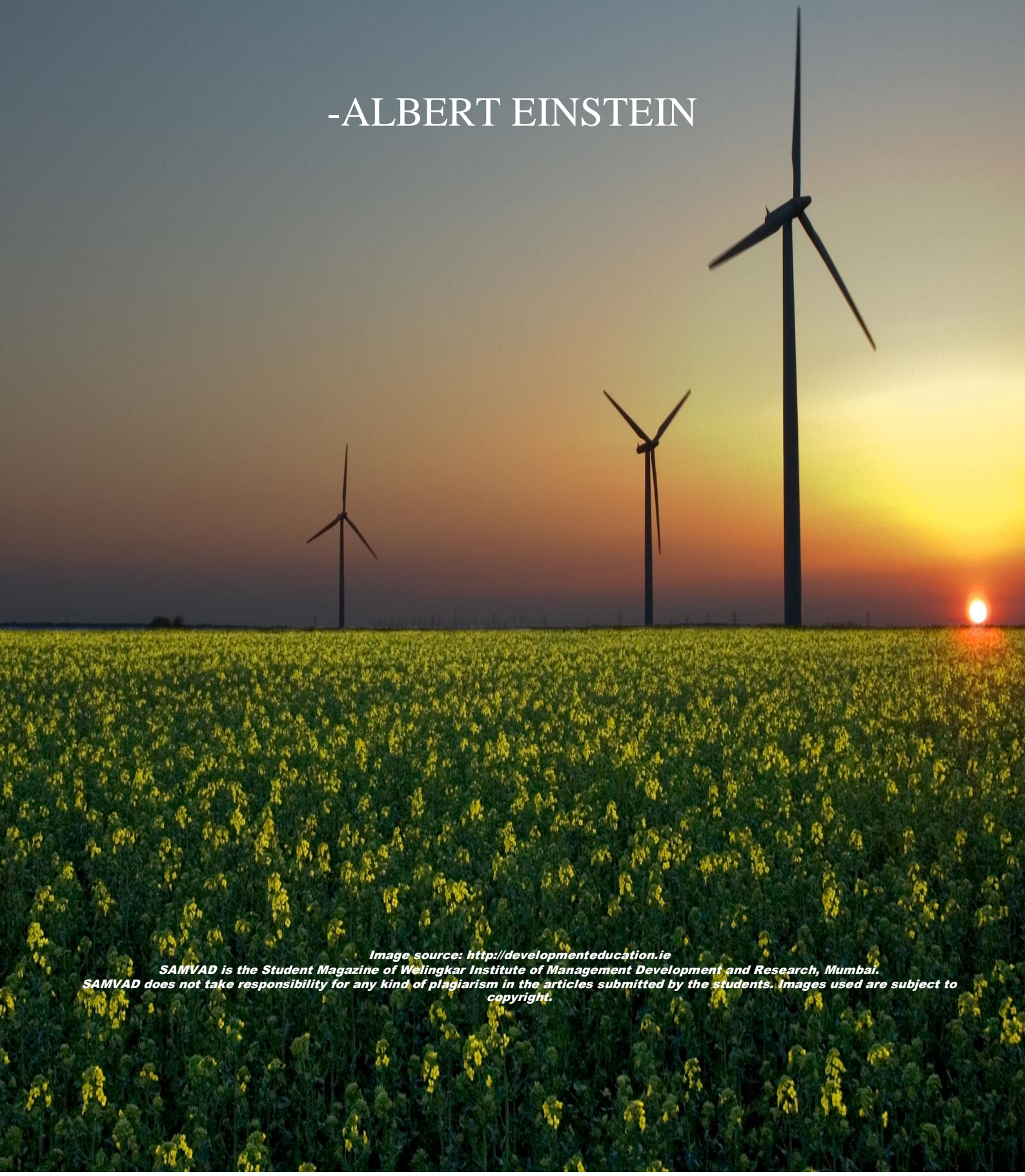
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GREAT SPIRITS HAVE ALWAYS  
ENCOUNTERED VIOLENT  
OPPOSITION FROM MEDIOCRE MINDS

-ALBERT EINSTEIN



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