

Industry Interface

Interview with Dr. A. Didar Singh
Interview with Dr. Ajay Mathur

Update from Punj Lloyd Institute
Leadership Program in Infrastructure
Management, Research Projects &
Workshops

Projects Now
Infrastructure
Projects Launched /
Completed

INFRA NOW

A Quarterly Newsletter by Punj Lloyd Institute of Infrastructure Management, ISB



Preface

The fourth edition of "INFRA NOW" carries the viewpoints of Dr. A. Didar Singh, Secretary General, Federation of Indian Chambers of Commerce & Industry and Dr. Ajay Mathur, Director General, The Energy and Resources Institute. It also provides an update on commencement of the second batch of Institute's flagship program "Leadership in Infrastructure Management". The institute has completed and launched the Smart Cities Index report on February 28, 2017. The Institute has also completed work on Urban Data Book for 53 million cities across 18 key parameters. The last section of the newsletter highlights some of the key infrastructure contracts awarded and completed from November, 2016 – February, 2017.

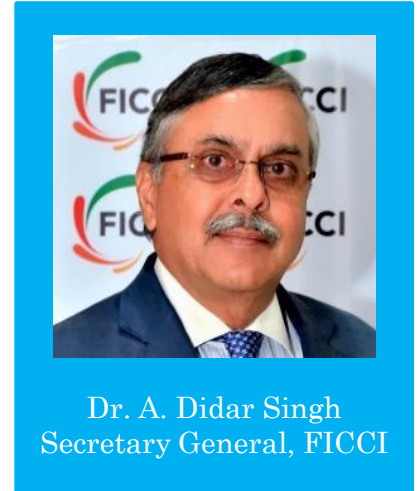
Highlight

Launch of
Smart Cities
Index Report

Industry Interface – Interview with Dr. A. Didar Singh

“India maybe a difficult place to do business but it’s a profitable place to do business”

The union government is making concerted efforts to ease the business environment in India. However, to improve the business environment of the entire value chain (starting a business as well as closing it down), both the union and state governments will have to come together. Dr. A. Didar Singh, Secretary General, Federation of Indian Chambers of Commerce & Industry (FICCI) spoke to Farhan Ahmed on host of issues like creating a tax-friendly environment in India, steps needed to increase investments from Indian Inc., and challenges associated with implementing Digital India and Make in India schemes. Excerpts...



Q. India remains one of the toughest places to do business despite concerted efforts by the current government. What are some of the areas that according to you need immediate attention?

A. We must not confuse doing business with just the ease of business as a category. Business happens in an environment where finance is an aspect, infrastructure is an aspect, labour is an aspect and markets are an aspect. So, when an investor takes a particular decision, he does it on these and other important factors and not just how easy it is to get a license. Getting a license is just a starting point, and I understand it is a very important starting point, but a small part of much larger ecosystem. Now India has been doing well because we have a good large market. I always make a point, “India may be a difficult place to do business but it’s a profitable place to do business!” - that is what brings investors. While it is very good to see that the government is working to ease the business environment and we totally support this initiative, we also believe that it shouldn’t focus on starting business, and should include the entire range of running a business including closing it down. This, of course, is not just a question of central government rules and regulations but also of state governments. So, it’s a very mixed bag of a business friendly environment which is different in different places. So, if states can really come up to the mark and do their own investment and business promotion, it will help the business environment as a whole.

Q. Striking a balance between tax-friendly environment and expanding tax base is crucial. Several positive steps have been taken, but challenges remain. How do we move ahead on this issue?

A. Many people in the business community may complain that ‘tax intimidation’ is still prevalent. When we talk about expanding the tax base, it is another way of saying that there is a requirement of raising the amount of money that is required for the budget for development. Every democracy is

dependent on taxation as the only source to expand its own revenue. If that is the case, there is tremendous pressure on tax administrators to manage and achieve the tax targets and that is what possibly leads to tax pressures. We, at FICCI, have been doing a series of reports which basically call for improving the overall tax administration and addressing issues between tax administration and businesses. This is constant endeavour on our part. We also do a survey with KPMG where we look at the response of individual businesses to existing rules and regulations. I am happy to inform that this survey is presented every year at the commissioners of taxes annual meeting in Delhi. We are extremely happy to see that the Revenue Department has been implementing changes based on survey's findings. This, however, is an ongoing process; you have to keep improving the appeal process, the settlement process, the claims process and others. There are several steps that need to be taken and I am sure that government is looking at them.

Q. India has emerged as the fastest growing economy but despite the challenging global economic scenario 2016. But Indian Inc. has been unwilling or apprehensive about undertaking fresh investments. Why are the key reasons behind it? What must be done to alleviate their concerns?

A. A fair amount of capacity addition took place in the last 4-5 years. Given how the markets and global environments were 5 years ago, a lot of Indian businesses expanded then. Because of the decline in global and country's trade, the additional capacities created were not being fully utilized. Roughly, I would say that capacity utilization dropped to about 70 percent. At present, it is has increased to about 80 percent or 85 percent, but until it reaches 100 percent, an investor will not invest or expand. The investor would like to optimally utilize the capacity created before he re-invests. So, that is an issue, therefore, linkages with the global markets is very important. Slow down in global markets has obviously impacted a very large part of that industry which is connected to the global market. Industries which are connected to more to the domestic market are in a slightly better position but those connected to the global markets have an issue. Given this scenario, you expect companies which are more connected to the domestic market picking up or putting in more new investments which is the case at the moment. For instance, in the e-commerce space in the domestic markets, businesses are booming and doing extremely well, the retail and food industry is doing much better in the domestic market. So, I would say, there are businesses which are doing well domestically and there are some which are connected to the global supply chain and there is a bit of slowdown prevailing there.

“With digitization, one gets the advantage of speed and optimization, less corruption and all other related benefits. But it won't be easy, the whole ecosystem needs to be digitalized not only parts of it.”

Q. Coming to your pet topic on e-governance, given where we are at the moment, what should be the roadmap if we are to achieve the objectives of Digital India?

A. Digital India is important, and there is a whole rationale why we, as a nation, should go down this road. But, it's not an easy road and e-governance is only one small part of it. Coming back to the same eco-system, a digital ecosystem is upon us at the global level. At the domestic level, everything is getting 'digitized' now; this will lead to a lot of pain and a lot of gain. The question is how do you manage it? So, to shift to a more 'digitized' way of functioning, whether you look at the internet of things or industry 4.0, these are realities of today and not just of the future. Industry, in many ways, will have to change and so does governance to match this whole question of an interface. With digitization, one gets the advantage of speed and optimization, less corruption and all other related benefits. But it won't be easy, the whole ecosystem needs to be digitalized not only parts of it.

Q. What are the three steps that are crucial to the success of Make in India scheme and make India as a preferred destination for manufacturing?

A. Land, labour and capital are three core areas of any business that need on going attention. It is not a current issue and has been there for last 50 years. It is a question of what we as a country and economy have evolved over time. If you look at these individually, land continues to be an issue. If you dig deeper, you will find that the single largest landlords are government industrial promotion agency. There is a lot of surplus land available in Industry Estates and with the new cities coming up and the Delhi Mumbai Industrial Corridor, land should not be a constraint. In terms of the labour, if you ask an average business person, labour laws is an issue but he manages through various ways. The state governments have also improved the labour law environment. So, steps have been taken in right direction. Capital, however, continues to be a very major constraint. The cost of capital in India is high compared to places around the world and therefore the cost of business in India is also high. In many other cases, it is the paucity of capital that comes back to haunt business and its expansion plans. Infact, foreign investors borrow from overseas at a much cheaper rate compared to an Indian company which has to borrow at a much higher rate. Investors must factor both productivity gains and the return on capital consummate with the cost that domestic company is going to put into it. These are some of the key issues, but we have to keep moving forward. We have been recording healthy growth rates and that is a good sign.

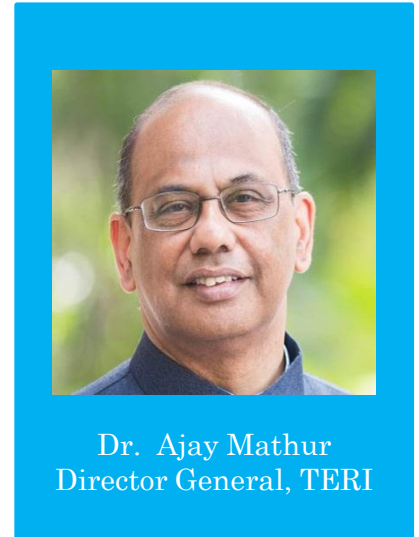
Q. In the infrastructure space you have advocated for having exit clauses for completed infrastructure projects. What must be done to ensure that the exit clause doesn't adversely affect the lenders or operational status of the projects?

A. There are well defined models available for it. If you provide for exit, what you do is the entire liabilities and package is handed over to the next person. It is not an insurmountable model. Infact, the NHAI provided for this model quite some time ago. The entire china infrastructure model is based on projects being built first by government and then bid out for private sector. We follow the other way we bid first, then build and then possibly hand it back to the government. So, these are differences in the models but we can learn from other models.

Industry Interface – Interview with Dr. Ajay Mathur

“Adopting business models that help us access new technologies at affordable prices is the way forward”

Dr. Ajay Mathur, Director General, The Energy and Resources Institute (TERI) recently spoke to Farhan Ahmed on India’s energy and climate change mitigation policy. He drew attention to key focus areas which are crucial to India’s endeavor of meeting Paris Climate Agreement targets. He elaborated on challenges associated with increasing access to electricity and steps needed to widen and deepen energy efficient practices, particularly for small and medium enterprises. Excerpts...



Q. India has recently ratified the Paris Climate Agreement. However, access to technology and funds to develop and deploy them is a concern. How do you see the targets being met within the timelines in light of these constraints?

A. Over the past few years, one of the things that we have learned is that the scale of demand in India results in quick price reductions in accessibility of technologies. For instance, look at photovoltaic (PV) modules or light-emitting diode (LED) bulbs: both of these products indicate that it is possible for us to not only access the kind of technology which is best suited for us, but also bring down its price rapidly. In the case of LED bulbs, in about two years or so, the price went down from Rs.310 per bulb to Rs.38. In future, I think, we need to look at business models that can help us access new technologies and make them available at affordable prices.

Q. What are the areas that need immediate attention?

A. There are three areas that I would focus upon. First, the key is to reduce the cost of capital. This is because whether you are talking about renewables or energy efficiency, there is a huge amount of initial cost to it. If you can access money which is cheaper, they become affordable. The first challenge is how to align our hedging mechanisms that we can offer a return of 6-7 % returns in India as against 2-3% in developed countries. The second challenge is how to manage energy storage, particularly batteries, at an affordable price, and create the platforms or business models for this. The third challenge is how to accelerate and quickly provide electricity, clean cooking fuels, liquid petroleum gas (LPG) to all households.

Q. What are your views on costs associated with integrating grid connected renewable energy in the overall consumption mix?

A. The challenge here is of storage, in particular, battery storage. This is because the price of the renewable energy, particularly PV is now approximately the same as that of a large scale coal-based power plant. In fact, in many cities, it is now cheaper to get electricity from solar than to buy it from the grid, especially for commercial and industrial uses. The challenge is to make firm electricity from renewables competitive so that one can get it at any time, even when the sun is not shining and the wind is not blowing. That is why the storage is important. Now the challenge is to quickly reduce the price of storage.

Q. In the light of these developments, how relevant is the concept of a hybrid power plant in the Indian context?

A. This is a business model issue. Certainly, there are times when the hybrid power station will make absolute sense. Likewise, given the nature of demand, there will be times when traditional power plants will make sense. So, I am not ideological about it but I do think that hybrid power stations have a place particularly during the transition phase. Ideally, during the transition phase, we will need the existing system as a base, and then piggyback on it the benefits that newer technologies provide.

Q. Pollution from thermal power plants is a serious cause for concern. Given where we are at the moment, how do we move ahead on issues of renovation and modernization (R&M) and life extension of old thermal power plants?

A. Well, I am not a great believer in R&M, and frankly, it hasn't worked. I think what we need to do is to shut down power plants which are old, small and inefficient. We may do that either by persuading state governments or by regulations. My estimate is the total capacity of such power plants will be in the range of 10,000 MW-25,000 MW. The retirement of these plants would be to everybody's benefit. And in current times, when we have got a huge generating capacity, far more than what the country needs, this is the right time to make a move.

Q. We have found that replicating energy efficient practices in small and medium enterprises continues to be a hurdle, more so, if the success story is to be replicated on a larger scale. What are some of the steps that may help consolidate the gains and possibly upscale it?

“Merely connecting households with electric wires will not solve the problem. In fact, this is proving to be a bit of challenge given that the state distribution companies work in an environment where the tariffs are such that they lose money on each kilowatt hour of electricity that they buy from power stations and sell to consumers.”

A. I wish I knew the answer. I think we understand what the challenge is. In small and medium enterprises, there is an entrepreneur who performs several functions (CEO, CTO, CFO, CMO, etc.). It will be unfair if we also expect him to spend time in sizing, financing and then monitoring new technology. So the answer is to provide packages which are guaranteed. This will assure the entrepreneur that if the outcome is fruitful, he will reap the benefits, and if it's not, his losses will be met. We are now working with both Energy Efficiency Services Limited as well as with vendors (of pumps, compressors, etc.) to see if such contractual agreements can be provided.

Q. What are the steps needed to deepen and broaden Perform Achieve Trade (PAT) scheme?

A. In the second phase of PAT, three new sectors have been added – refineries, electricity distribution companies and railways. But we do need to add more. I am particularly thinking of things like bus companies, roadways, airlines, etc. These sectors have now become large users of energy, so we need to add them quickly. There is also a proposal that instead of waiting for three years for every PAT phase, there should be a new phase every year. That means somebody who has come in still gets a three-year timeline, but new companies are added every year, each with a three-year timelines. So, there will be several phases that will be rolling in parallel. Second, I think the time has also come that in PAT, particularly for industries which were included in the first phase, we start introducing benchmarks. This is because the initial low-hanging fruits have now been achieved and the industry is now ready to move towards benchmarks either at the plant level, or the level of sub processes.

Q. The union government's flagship program on Smart Cities doesn't explicitly emphasize on making cities climate resilient. In your views, are different components mentioned in the Smart Cities program attuned towards achieving this objective?

A. At TERI, we worked very closely with Vishakhapatnam in the aftermath of *Hudhud* cyclone. The key challenges were: a) how are the municipal services organized, b) what are the likely disasters that may happen, and c) how do we make the cities as close to normal as possible (say in 15 days) after a cyclone has hit it. That is where issues like the design of sewers systems and their outflow will be crucial. Similarly, as far as municipal services are concerned there are certain key things that must be considered. In the case of a cyclone or a related event, there is now some data regarding services that failed. For example, if we know that in a given locality, electricity lines failed, we suggest underground lines in those areas. The same goes for telephone and other related services. So identifying the most vulnerable people, the most vulnerable infrastructure, and the most vulnerable services that are provided will be the key. These are three things that a city must identify in advance, and then have a game plan to deal with it.

Q. Currently, about 300 million people in India still don't have access to electricity. How can the current policy be tweaked so that this gap is met within a stipulated timeline?

A. Merely connecting households with electric wires will not solve the problem. In fact, this is proving to be a bit of challenge given that the state distribution companies work in an environment where the tariffs are such that they lose money on each kilowatt hour of electricity that they buy from power stations and sell to consumers. As a result, they rather drop loads and not supply electricity, instead of doing so. Therefore, re-looking at the tariff system so that 1) the poorest people get electricity at prices they are able to pay, and 2) overall it is remunerative to the power company, which essentially means that those of us who use air conditioners pay for the high-cost electricity that we use. Unless this tariff restructuring occurs, we will not be able to ensure that people keep on getting electricity even if the wires reach every household.

Q. What are some of the key factors that will shape India's energy and climate mitigation policy in the next few years?

A. One of the things that I think is extremely important is that we need to ensure that demand increases at a lower rate than it has in the past. This means a greater emphasis on energy productivity or energy efficiency. This is particularly true for industry. Second, we need to accelerate PAT, explore different options for SMEs, and make sure that we get renewable energy into the system at competitive prices as soon as possible. Third, we need to shift as many applications as we can which currently are dependent upon petroleum (like buses, cars, etc.) to electricity as soon as possible. Currently, we are in a position where we have more electricity than people can buy. We are also in a situation where we are looking at the not very distant future when electricity can be fully renewable; at least the new capacity that is added. These are the three steps that I think will form the basis of our strategy going forward so that our energy needs are fulfilled and climate considerations are met as well.

Update from the Institute

EDUCATION

Leadership Programme in Infrastructure Management (February 2017 – January 2018)

The 'Leadership Programme in Infrastructure Management' (LIM) is a one-year executive Programme offered by the Punj Lloyd Institute of Infrastructure Management at the Indian School of Business, Mohali Campus. The Programme was conceived in the year 2016 with an objective of enhancing the leadership and management competencies among mid-career professionals working in the infrastructure sector. The curriculum of the Programme is designed to provide a good understanding of various management areas such as economics, finance, statistics, law, public relations, human relations, social issues, etc., which assists in career advancement, entrepreneurship development and development of human capital in the infrastructure sector. The Programme is aimed at mid-career professionals. The delivery of the Programme is done through a mix of classroom and online learning systems as these professionals cannot devote full time on campus learning. The program has four terms in a year, which consists of both online learning (Technology Assisted Learning) and classroom lectures (Residency).

The first batch of LIM completed their final term in December 2016 and their graduation day is scheduled for June 4, 2017.

The second batch of LIM commenced in February 2017, and has 25 students. The orientation program was held on February 18 and 19, 2017 at the ISB Mohali campus. This batch has students from leading public and private enterprises, and is a unique mix of different sectoral exposure, richness in experience, previous academic training, and understanding of the core issues in the infrastructure sector in particular.

The first residency is scheduled from April 15 to 23, 2017 at the ISB Mohali Campus.

For more information on course, visit:
www.isb.edu/pliim/education/lim



Prof. Ramabhadran S.
Thirumalai

Academic Chair
Leadership Programme in
Infrastructure Management
Indian School of Business,
Mohali Campus

*“Our courses are
taught by a mix of
academics and
practitioners who
bring the latest
developments in the
infrastructure
sector to the
classroom”*

Workshops and Conferences

LAUNCH OF SMART CITIES INDEX

The Punj Lloyd Institute of Infrastructure Management launched the “SMART CITIES INDEX – A TOOL FOR EVALUATING CITIES” on February 28, 2017 at the India Habitat Center, New Delhi. The launch event was preceded by a presentation by Dr. O. P. Aggarwal and Mr. Ashish Mohan. The presentation highlighted the concept of the Index and emphasized on the potential benefit of the Index for various stakeholders – State Government, City Government, Investors, Students, Citizens etc. The presentation also emphasized on the Index as a tool to monitor progress of cities across time and also across each other to assess comparative performance.

The event was attended by about 40 dignitaries from government agencies, think tanks, academic institutions and other organizations. Some of the key attendees were Mr. Amitabh Kant, CEO, NITI Aayog, Ms. Jhanjha Tripathy, Joint Secretary, Ministry of Urban Development, Mr. Mukund Kr Sinha, Officer on Special Duty (Urban Transport), Ministry of Urban Development, Mr. Krishan Dhawan, Chief Executive Officer and Director, Shakti Sustainable Energy Foundation, Mr. Chetan Vaidya, Director, School of Planning and Architecture, New Delhi, Dr. A. Didar Singh, Secretary General, FICCI and Mr. Pradeep Singh, Deputy Dean and CEO-Mohali Campus, ISB.

Mr Amitabh Kant, Chief Executive Officer, NITI Aayog in his address at the Smart Cities Index Launch highlighted the need for capturing delta (change) in state of civic services offered by cities over a period of time. He said, "A study of this nature (Smart Cities Index) is crucial to understanding the relative position of cities in the urban context of India. In more than one ways, such indices force city officials to take note of their deficiencies and learn from their peers to improve upon them. Going forward, such indices will encourage city officials to create repository of data banks and update it on a real-time basis. This will lead to greater transparency and accountability for city officials as well as elected representatives.”



Research

SMART CITIES INDEX – EXECUTIVE SUMMARY

- Ashish Mohan , Analyst

The Smart Cities Index: A tool for evaluating Indian Cities report launched by the Punj Lloyd Institute of Infrastructure Management aims to develop a performance assessment framework to measure Indian cities across multiple urban indicators, and rank 53 cities with more than a million population. This framework will enable cities to compare cities across each other and also across itself over time. The project was supported by Shakti Sustainable Energy Foundation.

In recent years, there has been a concerted effort from Government of India (GOI) towards urban development through launch of several flagships programs – Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Pradhan Mantri Awaas Yojana (PMAY) and National Heritage City Development and Augmentation Yojana (HRIDAY).

As Smart Cities Mission and other urban development initiatives roll out, it will be essential to monitor progress of the cities and assess their performance.

Globally, there are various cities indexing framework that cover cities of the developed world and their ranking framework reflects the needs and situation prevalent in the developed world. These prevalent situations and needs are quite different in developing economies like India. Thus, there is a need to have an indexing framework that is relevant to Indian Context. The Index is intended to provide a framework for the Indian cities to assess their relative positioning in the country in terms of quality of life and develop a well-informed action plan for the improvement.

Approach Adopted

The project involved two stages of work. The first stage involved designing and developing the framework for Smart Cities Index, and the second stage involved pilot ranking of 53 cities with more than a million population in country.

Indicators used for for assessing the performance of cities across various urban sectors

The first step towards developing Indexing framework was to identify possible list of indicators that should be included in the Indexing framework. This was done through series of consultation workshops with experts from industry and academia along with extensive review of three of the best known international smart city indexing frameworks: a) Smart Cities Council ranking framework, b) European Union Smart Cities Ranking framework, and c) ISO 37120- Indicators for city services and quality of life.

After the review of Indices, an exhaustive list of 58 indicators was finalised for Index and based on the recommendations from the workshops, indicators were first clustered into closely associated groups. These groups were termed as Factors. Each of these factors were then mapped into a higher level group named “Characteristics”. Thus, a three tier hierarchy (comprising characteristics at the highest level, “Factors” at the second level and “Indicators” at the third level) was used for Indexing framework.

Characteristics

- a) Living: Represents the quality of life and availability of basics services.
- b) Governance: Represents the responsiveness of the urban local body and its service quality.
- c) People: Represents the level of education and inclusiveness of the residents of a city.
- d) Economy: Represents the extent of economic opportunities that a city offers.
- e) Mobility: Represents the ease with which people can move around within city and can access jobs, and education etc.
- f) Environment: Represents the air quality and the use of sustainable practices.

Methodology used City Ranking and Index

After several iterations and in consultation with experts, Smart Cities Index was arrived in following manner:

- a) Individual indicator values for each city was divided into 10 equal deciles after removing the outliers.
- b) For the Indicators with a desirable higher value (i.e. higher the better, example: GDP), cities that fell in the highest decile were given a score of 10, those in the next decile got a score of 9 and so on till the cities in the lowest decile scored 1. For the Indicators with a desirable lower value (i.e. lower the better, example: unemployment rate, homelessness), cities that fell in the highest decile were given a score of 1, those in the next decile got a score of 2 and so on till the cities in the lowest decile scored 10.
- c) For the missing data point, the average of other Indicators within the same Factor was used as a proxy.
- d) Once the marks were available for each indicator in a city, these were added up for all the factors and divided by the number of indicators within the factor, Hence, a factor specific index was generated.
- e) The Factor Specific Indices under each Characteristic was then added to arrive at the Characteristic specific index. Finally, the Characteristic specific indices for a city were added up to arrive at the comprehensive “Smart City Index”.

Summary of Index Results

Based on the methodology described above, for Smart Cities Index with 32 factors for final computation, maximum score obtainable by a city was 320. Out of 53 cities, Pune emerged as the top city with a score of (226), followed by Chennai (223), Thiruvananthapuram (220) and Coimbatore (291.4).

URBAN DATA BOOK

The urban data book is a repository of urban infrastructure services related data across 18 parameters (urbanization, Governance, Economy, Water Supply, Wastewater, Solid Waste Management, Urban Transport, Municipal Finance, Education, Employment, Migration, Housing, Slum Population, Urban Lighting, Urban Cooking Fuel, Safety, Institutional Framework and Air quality) and over 90 indicators. These data points have been collected through various sources – Right to Information (RTI) applications, Census 2001 and Census 2011, National Sample Survey Office, Ministry of Urban Development and Municipal Corporations. These data points will now be processed and tools will be employed to analyze and present the findings info-graphically.

ELECTRIC VEHICLES – ROADMAP FOR UPSCALING IN INDIA

The Electric Vehicles – Roadmap fro upscaling in India will be a whitepaper. It will cover the global scenarios on electric vehicle, highlight current Indian status on electric vehicle, and explain the role of different stakeholders across the value chain of EV – manufacturing, deployment and service. The whitepaper will focus on the challenges faced by different stakeholders to promote EV and will provide a set of recommendations on steps needed to alleviate the issues and concerns. The paper will be completed by April 2017.

A CASE STUDY OF DND FLYWAY PROJECT AND COMPARISON WITH OTHER ROAD CONTRACT FORMS

This paper will look into the reasons and factors that led to annulment of the concession agreement between the Delhi Government, Greater Noida Development Authority and IL&FS for the Delhi-Noida-Direct (DND) Toll way project. The specific features (procurement terms, toll mechanism, insurance, etc.) of the DND contract will be compared to other similar projects which have been executed public private partnership mode in India and abroad. The paper writing is in progress, and is expected to be completed by end April, 2017.

Student's Corner

CHALLENGES FACED BY ROOFTOP SOLAR POWER IN INDIA

- Pavan Karwa & Souvik Sen (PGP-2017, Indian School of Business)

India has set the target of building 175GW of renewable energy by 2022, pledging its allegiance to Paris Agreement in accordance with United Nations Framework Convention on Climate Change (UNFCCC). Out of the target 175 GW, 100GW is to be constituted by solar. In July 2015, the Government revised the targets set under Jawaharlal Nehru National Solar Mission (JNNSM) from 20GW to 100GW grid-connected capacity: 60GW utility scale and 40GW rooftop scale.

Growth of Solar in India

Solar PV is rapidly emerging as the king of Indian Renewables. The major reasons behind this growth are falling module prices and competitive nature of bidding for central and state tenders mainly issued by Indian Renewable Energy Development Agency (IREDA) and Solar Energy Corporation of India (SECI). Currently Minister of Power, Coal and Renewable Energy, Piyush Goyal, remarked that India had achieved a cumulative capacity addition of more than 10GW on March 10, 2017

Market Segmentation

India's solar industry can be clearly divided into four distinct categories:

1. Utility scale projects (>1MW)
2. Small and rooftop solar(1kW-1MW)
3. Small energy grids(100W-50kW)
4. Solar home systems and lanterns (<100W)

Small and rooftop solar will play an important role in the current Indian scenario. There is a need to understand the current business models and challenges present in this segment.

Small & Rooftop Solar

The segment has seen higher growth of 92% CAGR in capacity addition than utility-scale projects over last four fiscal years. This segment has seen the advent of innovative business models, namely, RESCO and OPEX model.

RESCO Model: The developer runs the solar system on BOOT--Build, Own, Operate and Transfer model, owning and maintaining the system for 25 years. However, the customer, on whose building the system is installed, pays the developer a fixed tariff. If additional or excess energy is generated, the same is fed into the AC grid, for which the utility compensates the developer. The developer decides the tariff with the customer on the basis of levelized cost of electricity (LCOE)

OPEX Model: This is similar to RESCO model, except that the system is not connected to the grid. Hence, the developer installs just the capacity that can be fully utilized by the customer and sells the energy just to the customer while utility doesn't come into the picture.

The following table enlists the challenges faced by each stakeholder under small & rooftop solar segment.

Challenges and recommendations for each stakeholder in rooftop solar segment

Stakeholder	Challenges	Recommendation
Customer	<ul style="list-style-type: none"> Lack of product awareness Delay in subsidy disbursement High upfront capex cost 	<ul style="list-style-type: none"> Easier method of subsidy payment Use of bank credit for capital investment
Developer	<ul style="list-style-type: none"> Educating customers High cost of capital Low residential utility tariff Product guarantees 	<ul style="list-style-type: none"> Easy finance from banks RPO compliance for DISCOMS Quality checks for equipment
Utilities	<ul style="list-style-type: none"> Loss of revenue Operational hazards Network augmentation Facilitating gross/net metering Duck curve 	<ul style="list-style-type: none"> Wheeling charges in distribution grid Venture into rooftop solar Automation TOD charge Energy storage system for duck curves

Projects Now

ENERGY, OIL AND GAS

Teesta Hydel Power Project adds 1200 MW with completion of Stage-III in Sikkim

The project, promoted by the Government of Sikkim through the Teesta Urja Limited on a Build-Own-Operate-Transfer basis, completed its third stage on February 2017 comprising 6 units of 200 MW each totaling 1,200 MW at a total cost of INR 13,965 crores from the initial costs of INR 5,705.5 crores in 2006. The EPC contractor is Andritz Hydro Private Limited while the turnkey contractor is Navayuga Engineering Company Limited. It might be noted that the project execution was stopped briefly in 2014 due to lack of funds which resulted in a time overrun of 5 years.

Koradi Thermal Power Expansion Project adds 1,980 MW with 3 units in Maharashtra

This project owned by the Maharashtra State Power Generation Company Limited was completed on July 2016 at a final cost of INR 13,652 crores from the estimated INR 7,920 crores in 2008. This project also saw a time overrun of almost 2.5 years. The project involved capacity augmentation of 1,980 MW (3 units of 660 MW each) at Koradi in Nagpur District of Maharashtra. The EPC contract was handled by Tecpro Systems Limited while the Boiler-Turbine-Generator contractor was Larsen and Toubro Limited.

NPCL begins construction on nuclear reactor in Haryana

The project involves setting up of a 2,800 MW (4*700 MW) light water reactor based nuclear power unit at Gorakhpur village in Fatehabad district, Haryana. The project is being executed by Nuclear Power Corporation of India Limited and was awarded on October 2016 at an estimated cost of INR 23,502 crores

L&T begins execution of coal based power unit for Neyveli UP Power Limited

The project involves setting up of a 1,980 MW (3*660 MW) coal based power unit in Ghatampur Tehsil of Kanpur Nagar District, Uttar Pradesh. The project is being executed by L&T-MHPS Boilers Private Limited for Neyveli Uttar Pradesh Power Limited through the traditional government procurement route and was awarded on August 2016 at an estimated cost of INR 17,237 crores. The project is expected to be completed by November 2018.

Reliance Infrastructure Ltd begins work on Lignite power station to come up in Bikaner, Rajasthan

The project involves setting up of a 250 MW (2*125 MW) Bithnok lignite power station in Bikaner district, Rajasthan. The project, awarded on November 2016, is to come up at the spread of over 2,883 hectares of land and is being executed by Reliance Infrastructure Limited for NLC India Limited through the traditional government procurement route at an estimated cost of INR 2,700 crores.

LNG re-gasification terminal to come up in Maharashtra

The project involves setting up a LNG re-gasification terminal at Jaigarh Port in Ratnagiri district, Maharashtra. The project is being developed by H-Energy Gateway Private Limited as a private infrastructure project which is to be constructed at an estimated cost of INR 2,400 crores. The planned project capacity of the terminal is 4 MMTPA (Million Metric Tonnes per Annum). The project commencement date is 27 February 2017.

Reliance plans captive power unit at Hazira, Gujarat

The project involves setting up of 372 MW (4*93 MW) steam turbine-based captive power plant at Hazira in Surat district, Gujarat. The project valued at INR 2,232 crores is being executed by Reliance Industries Limited. Work on the project started November 2016 and is solely implemented as a private infrastructure project.

Anantapur in Andhra Pradesh to get a wind power unit

The project involves setting up of a 226.8 MW wind based power unit at Amidala in Anantapur district of Andhra Pradesh. This project being executed by Skeiron Renewable Energy Amidyala Limited is being implemented as a private infrastructure project. The project valued at INR 1,820 crores commenced work on September 2016.

BHEL executing solar power project in Neyveli, Tamil Nadu

The project involves setting up a renewable energy grid project of 130 MW (2 x 65 MW) solar based power unit at Neyveli Township in Cuddalore district, Tamil Nadu. The project valued at INR 1,300 crores is being implemented by Bharat Heavy Electricals Limited for Neyveli Lignite Corporation India Limited. The project awarded on July 2016 through the traditional government procurement route.

Adani adds Kamuthi to its list of solar projects

This project owned by the Adani Group, completed installing 3 units of 72 MW and 2 units of 216 MW totaling 648 MW at Kamuthi in Ramanathapuram District of Tamil Nadu. The contractor for the project ABB India Limited completed the project on September 2016 at a final cost of INR 4,550 crores with a time overrun of 8 months.

ROADS AND HIGHWAYS PROJECT

Afcons Infra Ltd completes Expressway between Kannauj and Unnao in Uttar Pradesh

The project owned by the Uttar Pradesh Expressways Industrial Development Authority (UPEIDA), was completed at the cost of INR 2,880 crores far from the initial estimated costs of INR 1,648 crores investment in 2014. The project was completed on November 2016 with an approximately 4 month time overrun. This access controlled expressway project was executed with about 64 kilometers of road being laid by Afcons Infrastructure Limited.

L&T completes Beawar-Pali-Pindwara Toll way Project

The project is owned by the Larsen and Toubro Limited with NHAI promoting the project through PPP procurement on Build-Operate-Transfer basis. The resulting SPV (Special Purpose Vehicle), L&T BPP Tollway Limited, entrusted with the implementation of the project had completed the project works on July 2016 with a total length of 244.12 kilometers of road being laid at the cost of INR 2,388 crores with an escalation of INR 1,258.9 crores from the project announcement in 2009. The project corridor passes through the hills comprises of 9 bypasses (length aggregating to about 58 kilometers of new four lane construction), one tunnel in Sirohi area, 6 flyovers, 2 Rail-Over-Bridges, 14 Major bridges, 57 minor bridges and 4 toll plazas.

UP connects its biggest cities through Unnao and Lucknow Access Controlled Expressway Project

The project owned by the Uttar Pradesh Expressways Industrial Development Authority (UPEIDA), was completed at the cost of INR 2,839.05 crores far from the initial estimated costs of INR 1,290 crores in 2014. The project was completed on November 2016 with an approximately 4 month time overrun. This project was executed with about 63.09 kilometers

of road being laid by Larsen and Toubro Limited, the contractor for the project supported by Feedback Infra Private Limited and Redecon India Private Limited.

Six-Lane Agra-Lucknow Greenfield Expressway project in UP inaugurated

The six-Lane Agra-Lucknow Greenfield Expressway project was opened for public use on 21 November 2016. The 312 km stretch was completed in a record 23 months. The expressway connecting Lucknow with Agra in Uttar Pradesh is expected to reduce the travel time between the two cities from an estimated seven hours to around three and a half hours. The INR 7,360 crore eco-friendly expressway project was announced in April 2012. The route passes through the districts of Agra, Firozabad, Mainpuri, Etawah, Auraiya, Kannauj, Kanpur City, Unnao, Hardoi and Lucknow.

Dilip Buildcon bags contract for Kalmath-Zarap Highway project in Maharashtra

Dilip Buildcon has bagged a contract for Kalmath to Zarap Highway project on NH-17 in Sindhudurg district of Maharashtra. The order was awarded on Hybrid Annuity Mode (HAM) for INR 916 crores on April 2016. The proposal was for rehabilitation and up-gradation of the 44 km stretch between Kalmath and Zarap to four-lane with paved shoulder.

IRB bags contract for Kishangarh-Gulabpura Highway project in Rajasthan

IRB Infrastructure Developers has received a Letter of Award (LOA) for the six-laning of Kishangarh-Gulabpura Highway Package-I project in Rajasthan. The contract was awarded on Design-Build-Finance-Operate-Transfer (DBFOT) Toll basis. The stretch will cover 90 kilometers connecting Kishangarh in Ajmer district to Gulabpura in Bhilwara district on NH-79 & NH-79A. The INR 1,000 crores project is being implemented under National Highways Development Package Phase-V.

GR Infraprojects bags contract for Phagwara-Rupnagar Highway project in Punjab

GR Infraprojects have bagged the contract in September 2016 for Four-Laning of Phagwara to Rupnagar Highway project in Punjab. The order was awarded under Hybrid Annuity Mode (HAM). The proposal was to four-lane the 81 km stretch between Phagwara and Rupnagar passing through Banga Town and the proposed Nawashahir bypass. The INR 1,440 crore project also includes setting up 4 structures (Grade separator/flyover), 1 major bridge, 22 minor bridges, 1 vehicular underpass and 1 pedestrian underpass.

L&T bags contract for Western High Speed Freight Corridor Project

Dedicated Freight Corridor Corporation of India (DFCCIL) has awarded a contract to Larsen & Toubro (L&T) in consortium with Japan's Sojitz Corp for the Western High Speed Freight Corridor Project. The order valued at INR 3,800 crores, is for the 128 km stretch between Rewari in Haryana and Dadri in Gautam Buddha Nagar district of Uttar Pradesh. The design and build integrated package involves construction of track works, overhead electrification, traction substations and signaling & telecom works on the section.

RAILWAYS PROJECT

North East gets rail link boost with Lumding-Silchar-Jiribam-Badarpur-Kumarghat BG Project

The project owned by the Northeast Frontier Railway, was completed on December 2016 at a cost of INR 5,186 crores far from the initial INR 648 crores estimate back in 1996. The project had major trouble with a time overrun of almost 5 years. A total of 437 kilometers of tracks were laid with both the Lumding-Silchar section and Badarpur-Kumarghat-Agartala sections having 210 and 227 kilometers respectively.

3000 crore Jhansi-Khairar-Manickpur Railway Line Projectwork awardedto KEC International Ltd

The project envisages laying of a railway between Jhansi-Khairar-Manickpur and Khairar-Bhimsen railway line in Jhansi district for a total length of 411 kilometers. The project was awarded on August 2016 through the traditional government procurement route. This project is being executed by KEC International Limited for North Central Railway at an estimated cost of INR 3,000 crores.

Construction of new BG line in Paradip, Odisha

The project envisages construction of road bed, station buildings, passenger amenities, minor bridges, and general electrical works in connection with new BG rail line from Nuagaon 68.3 kilometer to Paradip81.2 kilometer on Khurda road division for a distance of 12.9 kilometers. The project was awarded to ARSS Infrastructure Projects Limited by the East Coast Railway in March 2016 with the contract valued at INR 142.79 crores.

GPT bags contract for Rishikesh-Karanprayag Rail project in Uttarakhand

Rail Vikas Nigam Ltd (RVNL) has awarded an INR 64 crore contract to GPT Infraprojects for Rishikesh-Karanprayag Railway Project in Uttarakhand. The order is for construction of major bridge over river Chanderbagha, rail over bridges (ROB) and rail under bridges (RUB) with approaches at road crossings over the Virbhadra-New Rishikesh-Shivpuri section. The contract has a completion period of 18 months.

GPT Infra bags contract for Mathura-Jhansi 3rd Rail Line in Uttar Pradesh

GPT Infra project has bagged a contract for Mathura-Jhansi 3rd Rail Line for 274 kilometers in Uttar Pradesh (UP). Scope of work is for construction of important and major steel girder bridges along with foundation, substructure and related protection works for the project. The order, valued at INR 220 crores, is expected to be completed within 36 months. The project also includes alterations to 29 stations, 2 important bridges, 19 major bridges and 278 minor bridges. Commissioning of the entire line is expected by August 2022.

URBAN INFRASTRUCTURE

Bhilai city gears up for implementation of water supply scheme

The project envisages implementation of Bhilai water supply scheme under “Amrut” scheme. It includes construction of 2 nos. of water treatment plant, distribution line 35,547 meters and rising main line 42,193 meters. The project awarded on November 2016 through the traditional government procurement route is valued at INR 242.73 crores. It is expected to augment supply to 72 MLD (Million Liters per Day). This project is being executed by Indian Hume Pipe Company Limited for Municipal Corporation, Bhilai.

Dholera to get potable water through a water treatment plant

The project envisages implementation of water treatment plant with a capacity of 50 MLD (Million Liters per Day) and clear water reservoir at TP1, potable water transmission main and master balancing reservoir (PW) at TP2 in DSIR, Dholera in Ahmedabad district, Gujarat. This project was awarded on October 2016 is valued at INR 94.85 crores. It is being executed by SPML Infra Limited for Dholera Industrial City Development Limited.

Riverfront Project across Gomti River changes the look of Lucknow city

This INR 1,500 crore project developed in the city of Lucknow across the Gomti River has amenities including Theme park, Jogger’s park, Cycle tracks, Water sports, Water Taxis, Cruise boats, Amphitheatre among others for recreational activities for the residents of the city. It was completed on November 2016 by the executing agency ANB Consulting Company Limited suffering a time overruns of about 2 years.

L&T commences work on Mumbai Metro Line 3

The project involves implementation of Colaba – Bandra – Seepz Metro Line 3 Project. This third line would comprise of 33.5 kilometer underground track. The project is being executed by Larsen & Turbo Limited & STEC of China in a Joint Venture for Mumbai Metro Rail Corporation Limited. This project was awarded on July 2016 and is expected to be completed by December 2019 for project cost of INR 24,500 crores as per the contract.

Nagpur to get metro connectivity by 2018

The project involves development of metro rail in Nagpur district, Maharashtra for a total length of 38.3 kilometers. The project includes North-South Corridor - 19.65 kilometers from Automotive Chowk to Multi-modal International Cargo Hub (MIHAN) and East-West Corridor - 18.55 kilometers from Prajapati Nagar to Lokmanya Nagar. The project is being executed by IL&FS Engineering & Construction Company Limited for Nagpur Metro Rail Corporation. In November 2016, Nagpur Metro achieved financial closure for the project. It

received Euro 130 million credits from AFD according to the Nagpur Metro Rail Corporation. The project was awarded on July 2016 for an estimated cost of INR 8,680 crores. The project is expected to be completed by March 2018.

Storm Water Drains to prepare Vijayawada for the monsoons

The project envisages implementation of storm water drainage scheme for a total length of 440 KM at Vijayawada City in Krishna district, Andhra Pradesh. The project awarded on August 2016 through the traditional government procurement route is valued at INR 345.18 crores. This project is being executed by Larsen and Toubro Limited for Public Health and Municipal Engineering Department, Andhra Pradesh.

Drinking Water Supply Scheme in the works for Berhampur, Odisha

The project involves setting up of a water treatment plant of 60 MLD, laying pipeline to supply water to uncovered areas for a total length of 208 kilometers, construction of 17 underground tanks and 10 overhead tanks at Berhampur in Ganjam District of Odisha. This project, valued at INR 471.98 crores, is being executed by Larsen and Toubro for Berhampur Municipal Corporation. The project was awarded on October 2016 through the traditional government procurement route and works are expected to be completed by October 2018.

L&T bags contract for Ahmadabad-Gandhinagar Metro Rail Project in Gujarat

Larsen &Tourbo (L&T) has bagged a contract worth INR 10,700 crores for the Ahmadabad-Gandhinagar Metro Rail Project Phase-I in Gujarat. Scope of work includes design and construction of two underground stations at Gheekanta and Shahpur with associated bored tunnels and ramp. Metro-Link Express for Gandhinagar and Ahmedabad (MEGA) is a SPV formed for implementing the project. The Metro Rail will span across 39 kilometers along two corridors having a total of 32 stations. Japan International Co-operation Agency (JICA) will provide a loan of INR 6,060 crores. The remaining will be shared between the Central and State governments.

IL&FS JV bags contract for Chennai Metro Rail Extension Project in TN

The 70:30 Joint Venture (JV) between IL&FS Transportation and Ukraine based PJSC Kyivmetrobud bagged a contract for Chennai Metro Rail Extension project in Tamil Nadu. The order valued at INR 370 crores was for design, validation and construction of underground stations and associated structures. The line will cover 9 kilometers between Washermenpet and Wimco Nagar of which around 2 kilometers will be underground and the remaining 7 kilometer network will be elevated. The project was announced in September 2014 and is expected to be completed by July 2019.

OTHER SECTORS

National Waterway-1 development to help offload cargo congested highways

The project envisages development of Allahabad-Haldia National Waterway-1 (NW-1) between Allahabad-Varanasi-Buxar-Patnand-Haldia on Ganga River. The project also includes construction of terminals at Allahabad, Varanasi, Ghazipur in Uttar Pradesh, Sahibganj in Jharkhand and Katwa in West Bengal to facilitate shipment and movement of bulk cargo. The project was awarded on October 2016 through the traditional government procurement route. This project is being executed by Larsen & Toubro Limited for Inland Waterways Authority of India at an estimated cost of INR 4,200 crores.

Development of multi-modal IWT terminal with a capacity of 7.9 MMTPA at Haldia

The project envisages development of multi-modal IWT terminal under National Waterway-1 (NW-1) in Haldia. The terminal will be spread over 61 acre of land at the Haldia Dock Complex. It will be utilized for transportation of coal, chemicals, fly ash, construction materials, petroleum and gas, etc. This project owned by the Inland Waterways of India handed the task of execution to ITD Cementation India Limited in December 2016 which is valued at INR 517 crores. The project is slated to be completed by August 2019.

International Airport Project in North Goa to give tourism a boost

The project envisages development of an international airport on an area of 2,271 acres at Mopa in Pernemtaluka of North Goa. The project is to be implemented in 4 phases. The project was awarded by the Airports Authority of India on September 2016 through the PPP procurement route on a Build-Operate-Transfer or BOT basis. A concession agreement to this effect was signed on September 2016 for a concession period for 40 years till September 2056. The project is being executed by GMR Airports Ltd at an estimated cost of INR 3,000 crores.

GVK-led MIAL bags contract for International Airport project in Maharashtra

GVK group-led Mumbai International Airport (MIAL), in February 2017, bagged the INR 16,000 crore contracts for the Navi-Mumbai International Airport project at Panvel in Raigarh district of Maharashtra. MIAL will build and operate the airport along with City and Industrial Development Corporation (CIDCO). The proposed airport will be spread across 5,604 acres. Of which, 2,866 acres will be used for aeronautical purposed. A total of 11 hangars and 2 runways will come up at the airport.

About the Punj Lloyd Institute of Infrastructure Management

The Punj Lloyd Institute of Infrastructure Management is established within Indian School of Business as a specialist Institute to Support the Infrastructure Industry. Its objective is to create top quality management capacity; to undertake research that would find solutions to the problems industry faces and to become a one-stop source for data and information on the industry. The Institute seeks to be the 'Go to place' for knowledge and solutions within the infrastructure industry.

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INFRA NOW Team

Dr. O.P. Agarwal, Executive Director, Punj Lloyd Institute of Infrastructure Management

Kinsuk Saurabh, Associate Director, Punj Lloyd Institute of Infrastructure Management

Farhan Ahmed, Senior Analyst, Punj Lloyd Institute of Infrastructure Management

Ashish Mohan, Analyst, Punj Lloyd Institute of Infrastructure Management

Tryambakesh Shukla, Teaching Assistant cum Analyst, Punj Lloyd Institute of Infrastructure Management

Vignesh Maninathan, Teaching Assistant cum Analyst, unj Lloyd Institute of Infrastructure Management

Suprotim De, Teaching Assistant cum Analyst, Punj Lloyd Institute of Infrastructure Management

Asis Sidhu, Manager, Punj Lloyd Institute of Infrastructure Management