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From the Editor's Desk...



Converting targets to operational projects!

Converting targets and commitments into actual operational projects is the greatest challenge before the government and the industry today. The recently convened RE-Invest 2015, which projected ambitious Wind and Solar targets of the order of 160 GW by 2019 had full backing of the government. On the one hand, in addition to Prime Minister Narendra Modi; Minister for Power, Coal and New & Renewable Energy, Piyush Goyal; Railway Minister, Suresh Prabhu and the Finance Minister Arun Jaitley addressed the delegates; Many state actors and ministers including Chandrababu Naidu, Chief Minister of Andhra Pradesh addressed the gathering of nearly 3000 delegates over three days. On the other hand, industry luminaries cued up to sign MoUs with the government. This shows how the government had positioned itself with its entire weight in this conference on renewable energy and it also shows how businesses and society responds to an event on renewable energy, if it is fully backed by the government.

A key highlight of the conference was a commitment made by different developers and public and private companies as well as lenders to execute 266 GW of RE capacity by 2019. This translates into an investment of about USD 320 billion, almost USD 80 billion every year. In recent years, FDI in overall economy is about 150 billion USD. In comparison, therefore, a sector specific investment target of USD 80 billion / year is indeed very challenging. Given the size and scale, such investments can only happen if there are mega changes in the economy as a whole and not just by sector specific measures. Therefore, to bring about these changes in the government, the way it functions and takes decisions, in banking, in infrastructure, in taxation and overall planning is the biggest challenge that India and the current government face today.

Every now and then, politicians have the tendency of announcing populist measures. However, now the time has come to evaluate these populist measures – such as subsidised electricity or other commodities like diesel, LPG, kerosene etc. Do these measures bring about overall greater efficiency in the system? If the government is looking at goals such as 266 GW by 2019 of RE capacity, it would have to act immediately in a number of areas and number of ways to make it possible.

Most importantly the conventional power sector mix and its management needs a relook in the face of significantly higher

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penetration of distributed renewable energy. If Solar energy of the order of 100 GW comes up, it is going to be available only in day time and that too peak at noon time. For rest of the time conventional power plants, wind energy may continue to meet loads. What should be the conventional generation mix in future. It becomes obvious that one needs generators in the system that can ramp up and down much faster without any penalties. Gas engines and hydro and pumped hydro capacities are going to be important. Similarly ability to transmit power from area of excess generation to areas of peaking loads is going to be equally important. Storage devices and other storage options, scheduling and forecasting are some of the aspects that have been discussed many times earlier. The point is that we now need to change the way we have been functioning. Call it reforms, progress or development but this change is essential in the functioning of the entire system. By “system”, we not only mean the power system but also all the entities involved, the discoms, regulators, government, private developers, OEMs and importantly the state governments. If the state governments do not buy into these targets, we are never going to be able to achieve or come anywhere close to these goals.

It is important, however, to keep in mind that announcement of these weighty commitments both, by the government and the private sector will become heavier and weightier as time passes by and if we do not make progress and achieve mile-stones that we must. These are real targets on which not only government - but also the sector and the stakeholders, will be judged! Therefore, a proactive and constructive approach is necessary. In all of this, we also need to be confident of Affordability – the invisible elephant in the market place.

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From the Chairman's Desk

Dear Friends

There were a lot of activities during the last few weeks, more notably are the following:

1. **RE-INVEST 2015:-** The first renewable energy global investors meet and Expo organised by the MNRE was a grand success. Prime Minister Narendra Modi inaugurated RE-INVEST 2015 on February 15, 2015 at New Delhi. More than 2,800 delegates from 40 countries had attended the programme. In his address the Prime Minister mentioned that we should start handling installing capacity in Gigawatts not just in Megawatts. He said that India had focused mainly on thermal, gas, nuclear and hydropower and it is time that we had added three more sources of energy i.e. Solar, Wind and Biomass. The Prime Minister suggested that our country's farmers could lower their input costs if only they could use solar pumps and micro-irrigation. Shri Modi urged closer cooperation between states and the Centre with regard to improving domestic energy generation by adopting renewables in a big way. Shri Piyush Goyal mentioned that the power sector was going through an unprecedented transition globally which focuses on green and clean energy. He further mentioned that Reinvest 2015 ushers in a cleaner and brighter India and he was hopeful that the conference can attract investments of up to \$ 200 billion.

One of the highlights later the afternoon was the renewable energy investments and initiatives in Andhra Pradesh, a presentation made by Shri N Chandrababu Naidu Chief Minister of Andhra Pradesh. We were impressed to see how the Chief Minister of Andhra Pradesh was able to answer a number of technical questions and took prompt and fast decisions. He also unveiled the progressive Andhra Pradesh Wind & Solar Power Policy 2015. This meeting was also attended by the Honorable Minister Shri Piyush Goyal. The Andhra Pradesh Chief Minister mentioned that the power deficit in the State has been reduced to almost nil.

On the second day Mr. Michael Bloomberg, a three term Mayor of New York City who is also the UN Secretary General's special envoy for Cities and Climate Change addressed the gathering. He said that "People want to live where businesses want to invest and businesses want to invest where people want to live". He said that confronting

climate change goes hand-in-hand with smart economic growth.



In one of sessions, the Union Minister for Railways, Shri Suresh Prabhu who is considered as an architect of power reforms in India said that India must take a quantum leap in Renewable Energy. The Minister suggested that there should be a strong policy framework backed with legislative framework and that there should be competition among States to adopt Renewable Energy.

Just a few of us had the opportunity to see the Hon'ble Minister Shri Piyush Goyal address "Talkathon" where he fielded questions and comments made on-line by members from all over India. The Minister emphasized on two things, i.e. imparting skills to youngsters to cater to the huge demand in the R E Sector and that youngsters at the college and school level should get interested in Renewable Energy. He urged the schools and colleges to install solar panels and small wind turbines on roof-top in their premises.

The Valedictory function on the third day was an equally grand event. It was attended by Shri Suresh Prabhu, Hon'ble Minister for Railways, Shri Prakash Javadekar, Hon'ble Minister of Environment and Forest and Shri Arun Jaitley, Union Minister of Finance.

Shri Javadekar said that his Ministry will provide Green Channel for setting up projects of Green Energy. Shri Suresh Prabhu mentioned that this conference is a turning point in attaining "Energy Swaraj" and he urged that in the coming years RE should not insist on any subsidies. Shri Piyush Goyal mentioned that RE has become part of mainstream plan of India's Energy future and the goal is to make India as the RE Capital of the world. Shri Jaitley mentioned that in providing cheaper electricity to the citizens it is important that the environment is not harmed. The team from Energy Next, New Delhi should be complimented for bringing out a Daily Newsletter giving a gist of the proceedings of the various sessions since one cannot sit in all the sessions because there were parallel sessions being conducted and each of them had good speakers and was well attended.

2. **Developments at TNEB:-** On February 24, 2015, the CE NCES had convened a Coordination committee meeting at TNEB HQs wherein officers from numerous Departments of TNEB were present and it was a very good beginning. Representatives of the wind sector were present and they had the opportunity to air their views and grievances to get clarifications. Here I would like to thank the CMD of TNEB who had given his consent for such interactions. The meeting was chaired by the Director (Generation), TNEB. We have requested TNEB to convene such meetings regularly every month.
3. **Meeting with SRPC and TNEB officials on February 25, 2015:-** Thanks to TNEB Chairman, we had the opportunity to meet the SRPC officials (who had come to TNEB Chennai) in the presence of senior officials of TNEB including the Director & CE Operations. IWPA explained how a larger regional grid can handle TN wind energy better than a smaller State grid. Your association suggested that TNEB & SRPC work out modalities in such a way that there shall not be loss either to TNEB or to SRPC. Any expenditure could be socialized

as assured by the Hon'ble Minister Shri Piyush Goyal. The TNEB officials have been requested to initiate action in this regard. Association's help would be available wherever necessary. TNEB has to now give their consent early to SRPC to allow them to manage wind energy of Tamil Nadu at the Regional level for better evacuation in the coming season in 2015.

4. **Fourth international wind conference and exhibition WE20 by 2020:-** IWPA normally conducts an international wind conference and exhibition every year. However, due to the overall slump in the wind industry for the last two years, the conference was not held. This year we have decided to conduct the fourth international wind conference and exhibition at the CODISSIA trade fair complex at Coimbatore from June 21-23, 2015. May I take this opportunity to request all of you to support the program by sponsorship as well as registering delegates. We have requested the Honorable Minister Shri Piyush Goyal to inaugurate the exhibition and conference. We will make this a grand affair with your support.






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on 21st, 22nd and 23rd June 2015

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Letter received from TANGEDCO

: T A N G E D C O :

From

Er. A. Subramanian, B.E., M.I.E.,
Chief Engineer/NCES,
TANGEDCO,
144, Anna salai,
Chennai 600 002.

To

1. Indian Wind Power Association
2. Tamilnadu Spinning Mills Association
3. The Southern India Mills Association
4. Indian Wind Turbine Manufacturers Assn.

Lr.No.CE/NCES/EE/WBP/AEE2/F. SRPC Meeting/D.230/15, dt:21.02.2015

Sir,

Sub: NCES – Meeting proposed on 24.02.2015 with IWPA, SIMA, TASMA & IWTMA to discuss the SRPC subject and other issues on wind energy - intimation - Reg.

Ref: 1. IWPA Letter dt. 10.10.2014.
2. SRPC Meeting Letter dt. 11.02.2015.
3. CMD/TANGEDCO approval dt. 21.02.2015.



Based on the representation of IWPA, notice of SRPC and approval of CMD/TANGEDCO, a meeting is proposed on 24.02.2015 at 2.30 PM at Appadurai Hall of TANGEDCO Head Quarters Building, to discuss the SRPC subject along with other following issues:

- A) Restriction on TN to inject/draw power within a variation of 150 MW
- B) Renewable Energy Management Centre (REMC)
- C) Discrepancy in wind generation data and ABT meters
- D) Low Voltage Ride Through (LVRT)
- E) Relaxing 5D x 7D spacing distance between WEGs
- F) REC Generation adjustment at first priority.

The Chief Engineer/Planning & RC, Chief Engineer/Transmission, Chief Engineer/Operation, Chief Engineer/P&C, Chief Engineer/Commercial and Accounts branch are requested to participate in the meeting.

Yours faithfully,

CHIEF ENGINEER/NCES

Copy to the Chief Engineer/Planning & RC/Chennai-2
Copy to the Chief Engineer/Transmission/Chennai-2
Copy to the Special Officer/Operation/Chennai-2
Copy to the Chief Engineer/P & C/Chennai-2
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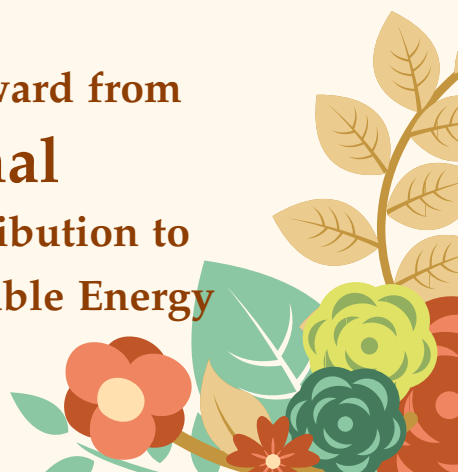




Congratulations



Chairman, IWPA
receives Vocational Excellence Award from
Rotary International
on February 10, 2015 for his contribution to
Small Scale Industries and Renewable Energy





National Council Member Shri Kannan interacting with a visitor just outside the IWPA stall at RE-INVEST 2015 at Hotel Ashoka, New Delhi.



Hon'ble Minister Shri Piyush Goyal witnessing the proceedings of one of the Sessions at RE-INVEST 2015 held at Hotel Ashoka on February 16 & 17, 2015.



Prof. Dr. K Kasthurirangaian, Chairman, IWPA participating in the Q&A Session in the Session on Energy Storage

Media News

GM Will Soon Use Wind to Power Its Factories

General Motors wants you to know that it's thinking about the environment.

Today, the big-name car maker announced that it will soon use wind to power its manufacturing operations. GM has signed an agreement with Enel Green Power to procure 34 megawatts of wind power from 17 wind turbines for its 104-acre Toluca Complex in Mexico, the company said in a press release.

The construction of the wind farm will begin in the second quarter of 2015, and once it's complete, 75 percent of the energy coming from the wind turbines will fulfill most of the electricity needs of the Mexico facilities. GM says that the remaining 25 percent will help power its Silao, San Luis Potosi, and Ramos Arizpe complexes, also in Mexico, and that the project, on the whole, will help curb nearly 40,000 tons of carbon dioxide emissions at these facilities annually.

"Our commitment to sustainable manufacturing processes is one way we serve and improve the communities in which we work and live," Jim DeLuca, GM's executive vice president of global manufacturing, said in a statement. "Using more renewable energy to power our plants helps us reduce costs, minimize risk and leave a smaller carbon footprint."

GM is just one of many corporate giants pushing their operations towards clean energy. Elsewhere in the car industry, BMW is using hydropower to make the carbon fiber that goes into its i3 electric car. And across the internet, tech giants such as Google and Apple are using cleaner energy to power their data centers.

Recently, Google announced it will soon be using wind power to run its Googleplex headquarters in Mountain View, California, on the heels of Apple revealing a similar effort.

GM says its project will allow the company to reach its goal of using 125 megawatts of renewable energy by 2020 four years earlier. The company already uses some renewable energy—a combination of solar, landfill gas and waste to energy—to power 9 percent of its North American operations. The addition of wind power, the company says, would push its renewable energy use up to 12 percent.

"This is the largest power purchase agreement that we've done to date," says Rob Threlkeld, GM global manager of renewable energy. "It also helps us diversify our portfolio of energy sources—it's cheaper than our current source of power in Mexico—and it makes sense from a sustainable standpoint."

Source: Wind Insider

Requesting TANGEDCO to reply positively to SRPC's Letter on Wind Evacuation in Tamil Nadu

Prof. Dr. K Kasthurirangaian
Chairman

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February 4, 2015

Dr. M Sai Kumar IAS
The Chairman & Managing Director
Tamil Nadu Electricity Board
N.P.K.R.R. Maaligai, No. 144 Anna Salai
Chennai - 600 002

Respected Sir,

Consequent to our meeting of PGCIL at New Delhi and the German Consultants (GiZ) appointed by the Ministry of Power for installing REMCs (Renewable Energy Management Centre) under the 12th Plan in various States and also the letters addressed to the meets of SRPC on 16.10.2014 and 12.11.2014 (copied to TANGEDCO).

SRPC has taken a positive stand about its managing wind control area for wind energy generated in Tamil Nadu. SRPC has written to TNEB requesting concurrence on the initiatives and decisions taken by SRPC for handling wind power. When TANGEDCO permits SRPC to take such a takeover of wind as a wind control area that will result in:-

- 1. Increase control area for better dissipation of variability:-**When control area is increased from State to Region from 12000 MW to 35000 MW area variability can be better managed.
- 2. Host State not to be penalized:-** Tamil Nadu as a host State not liable for any levy of UI charges for any wind induced change in frequency beyond the present tight limits and also not liable to pay for any excess variation in the scheduled injection of wind energy.
- 3. Banking not to hurt TANGEDCO:-** It also protects and helps Tamil Nadu because whatever is the excess wind generation can either be sold outside or what that is banked by the Tamil Nadu wind generators can be re-banked / swapped with utilities in other States during June – September to be returned back during subsequent November – April, resulting in huge savings for TNEB.
- 4. TANGEDCO shall have the first right of refusal over the wind energy evacuated even when SRPC / SRLDC evacuates the wind energy in Tamil Nadu.** On 29.12.2014, NLDC reports in total transfer capability that there is no limit fixed for export of energy from southern region. We understand from PRDC that capability of Tamil Nadu to export can go up to 3800 MW.

Indian Wind Power Association

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Renewable Energy Management Centre (REMC) : - Recently we had discussions with Power grid (PGCIL) and GIZ who have been given the responsibility by Indian government, under KFW funding for installing the REMC in the wind rich States of India. As per 12th plan targets REMC in Tamil Nadu is proposed to be established in 2016 -17. We are requesting PGCIL & GIZ for installation of REMC early in Tamil Nadu in 2015 to avoid loss of 3 billion units of wind energy in 2015. As of now Gujarat REMC has been installed as a pilot project. It came to light that REMC Gujarat to enable forecasting called for and State utility could not provide data like, real time data on total wind generation in the State and the wind velocity. For effective functioning, any grid manager needs to know quantum of real time wind generation in State and forecasting. As it stands now Tangedco has no infrastructure facility for collection to give such data. IWPA has offered to install WEIF for collection of such data in Tamil Nadu.

Need for having a set up for visibility for Wind in Tamil Nadu:-

Real time generation of wind energy for the whole State to be measured and synthesized it to make it available on the screen of grid manager handling the wind control area. Either a forecaster appointed by SRPC / PGCIL or REMC would synthesize real time wind generation and the day's Met data and historical data to give forecast of wind after half an hour, 1 hour, 4 hour and 24 hour to the grid manager who can conveniently schedule wind energy.

Though initially the forecasting error may be high to the tune of 30% – 40 % within a year by constant practice and experience error can be brought down to the lower level say the experts.

Measuring real time wind generation:- Wind generation for the whole State of Tamil Nadu needs fixing of energy meters with sim cards in all wind energy pooling stations in the State which number we hope is 110 as per preliminary estimations. Real numbers to be confirmed by actual survey and investigation.

A detailed project report (DPR) has to be prepared by IWPA with information, support, co-operation and guidance from field

Sub Station level TNEB staff, CE-NCES, CE-Operations, Director-Generation and MD –TANTRANSCO. Now we need the TNEB order to permit enable IWPA Chief technical advisor and his people to reach the TNEB staff at various levels and places in Tamil Nadu grid to survey and gather information and later to install.

After survey, IWPA will prepare DPR, Call tenders from reputed service providers and install the set up again with the co-operation, supervision and support from TNEB field level and top level people.

We request TNEB not to levy any charges like meter testing, service charges for installation and the alike for making the set up as of no levy. Ground level or Cloud level Servers to be installed to show on monitor, the needs of grid manager. SRPC to name the forecaster. The operation set up can start once installed. To set up the initial phase might take anything like 6 months to 1 year and final phase in 2 years.

IWPA is willing to accept any payment for above set up of visibility of real time wind energy generation or WEIF in whole State if offered by TNEB.

We humbly request:

- i. TANGEDCO's positive reply to SRPC's letter to TANGEDCO on the subject and
- ii. TNEB to issue early orders permitting IWPA to start installing WEIF.

Thanking you & With Best Wishes & Regards,

Yours faithfully

For Indian Wind Power Association

Prof. Dr. K Kasthurirangaian
Chairman

Copy to:

1. Managing Director, TANTRANSCO, Chennai
2. Director Generation, TANGEDCO, Chennai
3. Energy Secretary, Tamil Nadu Electricity Board, Chennai

To Avoid Annual Loss of 3 BUs of Green Power. SRPC to Evacuate Wind & PGCIL to install REMC in 2015.

Prof. Dr. K Kasthurirangaian
Chairman

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February 7, 2015

Shri. Piyush Goyal Ji,
Hon Minister for Power, Coal & New and Renewable Energy
Govt. of India, New Delhi - 110003

Respected Sir,

Please accept our thanks for announcing on 31.01.2015 at SCOPE complex meeting that AD would continue on long term basis for wind and solar and also for discussing various RE problems.

Sir, It is very much comforting when you asked what you expect us to do when discussing about "avoiding evacuation losses on three billion units annually in Tamil Nadu."

Here is our request as to what the Minister and MNRE can do in the above direction.

It is nice of SRPC to have discussed in their six state meet and agreeing to evacuate wind energy in Tamil Nadu treating wind as a National asset and treating it as a separate control area. SRPC has written to TNEB and TNEB's positive reply is expected. Honorable Minister can put in a word to Energy Secretary of Tamil Nadu and Chairman and Managing Director of TNEB to expedite their positive reply and support SRPC initiative to success in the larger interest of the Nation.

As per the 12th plan Renewable Energy Management Centre (REMC) has been scheduled to be created in all wind rich states including Tamil Nadu during 2017. To avoid the green power losses during 2015 and 2016, PGCIL may be instructed to expedite and install REMC in Tami Nadu in 2015 itself. This involves installing energy meters in 110 wind pooling stations in Tamil Nadu with communication facility and consolidating the

information using the common server to show on the monitor of the grid manager as to how much is the real time wind generation in Tamil Nadu. Forecasting based on this real time generation may also be made available to the grid managers to enable him schedule wind energy.

SRPC on receipt of positive reply from TNEB may approach CEA and CERC for necessary approvals and implement well in time for 2015 wind season that starts in May 2015.

Thanking you,

With best wishes and regards,

For Indian Wind Power Association,

Prof. Dr. K.Kasthurirangaian
Chairman

Copy to

1. Dr. Upendra Tripathy, Secretary, MNRE, Delhi
2. Ms. Varsha Joshi, JS, MNRE, Delhi
3. Dr. Dilip Nigam, Director - Wind, MNRE, Delhi
4. Dr. Subir Sen, GM, PGCIL, Delhi
5. Mr. K. Sandeep, Senior Engineer, Smart Grid, PGCIL, Delhi
6. Mr. Kashish Bhambhani, PGCIL, Delhi
7. Dr. Indradip Mitra, GIZ, at NIWE Campus, Chennai
8. Earnest & Young, Delhi (Consultant for REMC)
9. Mr. S.R. Bhatt, Secretary, SRPC, Bangalore

Indian Wind Power Association

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Wind Banking is to be included in Electricity Act Amendment to promote Green Energy

Prof. Dr. K Kasthurirangaian
Chairman

603 'C' Block, Pioneer Complex, 1075, Avinashi Road
Coimbatore - 641 108 INDIA
Phone : 91-422-6585908, 6586908
Fax : 91-422-2248408
E-mail : office@rsmautokast.com



February 7, 2015

Shri. Dr. Upendra Tripathy
Secretary, Ministry of New and Renewable Energy
CGO Complex, Lodhi Road, New Delhi – 110003

Kind Attention: Ms. Varsha Joshi, JS, MNRE & Mr. Dilip Nigam, Director-Wind, MNRE

Dear Sir,

Green energy consumption could be made more meaningful only if the green energy from wind is utilised to its potential. The successful story of Tamil nadu wind mill lies in the promotional policy of then Tamil Nadu Government extending yearly banking provision with reasonable banking charges. All of us know that the wind is seasonal (May to September) and it could not be expected to generate the energy round the clock through out the year.

An Indian Entrepreneur who needs an energy security and cheap affordable energy will go in for the captive plants. On choosing among various options of captive generation, conventional generation plants like Thermal will be more attractive since it does not involve much policy inventions. On the other hand, with the wind power, the location of the plant must be at windy areas and they have to bear the transmission and distribution losses of the energy generation point to consumption point. These losses are arrived in actual including all the inefficiencies of state utilities and Discoms. Further, the green energy like wind cannot be planned for the full capacity of the consumption of the consumer. An Indian Entrepreneur, when planning the capacity of the conventional plant, will plan with the PLF of 80 -85% where as this will be 20 – 30% only with the wind. In other words, almost three times more the capacity has to be planned when invested in the wind power. Even an investment of 3 times capacity is done, the generation during the windy season will be more than the actual consumption of the particular consumer. This excess generation should be saved for the further consumption in the later part of the year. This requires an effective mechanism called “Banking” which allows the wind generator to supply the excess generated units than their consumption during the windy period to discoms/state utilities who can sell / swap / rebank the units to other needy consumers / other discoms.

These supplied units could be withdrawn back later by the captive generators. Thus, they will be assured of the cheap green power for their consumption always. With a large integrated electricity grid available in our Country, this type of mechanism could work easily where

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the green power consumption is maximised to 100% in certain European countries by integrating the grid among the Nations. Year round banking supports “ Make in India “ concept to promote export competitive industries who get cheap wind energy year round.

The yearly wind banking is not a new concept which is very simple like regular financial banking operation. In the financial banking, excess cash available with the person will be deposited in the bank and the bank will lend a loan to the needy person and will charge a little extra to the borrower to justify their banking operation. However, in the wind banking concept, the generator who banks their energy with the Discom/state utility is asked to pay the banking charges varying from 2 to 5% as fixed by the regulators.

Even then, with these reasonable banking charges, a captive consumer of the Indian Entrepreneur can foresee their energy requirement and will make an investment in the green wind power rather than the conventional thermal power if the wind banking concept is followed throughout the nation. Such yearly banking is successfully run in Tamil Nadu, Karnataka, parts of AP, Maharashtra & Gujarat. There are success stories of many such industries in MSME & Textile sectors.

Hence, we request the honourable minister to make an amendment in the Electricity Act by including a clause that the wind green power generation should be motivated by providing “Wind Banking” by the utility / discom to the Indian captive consumer. This will help the Indian captive consumer to look wind as the complete alternative to the conventional power plants for their own consumption.

Thanking you in anticipation.

With best wishes and regards,

For Indian Wind Power Association,

Prof. Dr. K.Kasthurirangaian
Chairman

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99/2A, School Road, Chinnavedampatti, Coimbatore - 641049.
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E-Mail : revathigears@yahoo.com

Thanks for convening meeting of Wind Stakeholders and Providing IWPA the opportunity to address TNEB - SRPC Meet on 25.2.2015 on TNEB initiating efforts for a larger grid to handle wind power

Prof. Dr. K Kasthurirangaian
Chairman

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February 27, 2015

Dr. M. Sai Kumar IAS
The Chairman and Managing Director
TANGEDCO, N.P.K.R.R. Maaligai
No. 144 Anna Salai, Chennai - 600 002

Dear Sir,

Thanks for Coordination committee meet: We thank you for the meeting that was convened on February 24, 2015 at TNEB under your orders. It was an enormous success in creating cordiality among wind stakeholders and TNEB officials and provided the opportunity to stakeholders in wind energy to clarify their doubts with officers from various sections like NCES, Operation, Planning, Finance, etc.

We request that such meetings may be convened every month.

TANGEDCO to initiate early efforts for SRPC to evacuate Tamil Nadu Wind Power: Speaking at the SRPC Meeting held on July 24, 2014, the then TNEB Chairman had made an appeal to SRPC that a larger grid can more easily manage a sizeable generation like of 4,289 MW of wind energy recorded in Tamil Nadu with an intra-day variability of 2,000 MW. He added, wind is to be treated as a common natural resource and Tamil Nadu should not be penalized for being wind rich.

On similar lines IWPA had appealed to TNEB and SRLDC to carve out a separate wind control area in Tamil Nadu and evacuate wind energy in full without wastage. In this connection the SRPC has suggested the following in the SRPC meeting held on 16-10-2014.

1. The WEG's in Tamil Nadu could be offered as a separate control area.
2. The host State namely Tamil Nadu does not have to manage the wind deviations.
3. The wind deviations will be absorbed by the Regional Grid.
4. SRLDC could undertake forecasting & scheduling the Wind Power.

Indian Wind Power Association

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In the above meeting Telangana state has offered to absorb the surplus wind power subject to putting in place an appropriate commercial mechanism.

This cannot be done without your cooperation. Therefore we request you to extend all possible help to implement this proposal in the next wind season.

All these could be done with suitable modalities in such a way that TNEB / SRPC will have no financial losses. Any expenditure could be socialized as announced by the Hon'ble Minister Shri Piyush Goyal at the RE-INVEST Conference held at Delhi recently on February 15 – 17, 2015.

Sir, we the wind power generators are with you.

IWPA has engaged the services of PRDC (an energy consultant based in Bangalore) who have since submitted a report that enough corridor capacity is available to export up to 3,800 MW of wind power of Tamil Nadu. Traders at the Power Exchange have also expressed their willingness to swap or sell the amount of wind energy as directed by SRPC / TNEB.

As you are already aware, the establishment of REMC (Renewable Energy Management Centre) in Tamil Nadu also is part of the 12th Five Year Plan with funds allocated. We have requested the Hon'ble Minister Shri Piyush Goyal to instruct Power Grid to accelerate the process and install the REMC in 2015 itself, which he has readily agreed.

We thank the Director Generation for requesting CE NCES and the substations to make available the data for preparing DPR for the establishment of REMC. .

The appeal is to make SRPC wind evacuation possible before the onset of the next wind season in May 2015.

We thank you once again for all the cordiality and look forward to the initiatives to make things happen on time.

Thanking you

With best wishes and regards.

Yours faithfully

For Indian Wind Power Association

Prof. Dr. K Kasthurirangaian
Chairman

Copy to:

1. Director Generation – TNEB
2. Director Operation – TNEB
3. Director Transmission – TNEB
4. CE NCES
5. CE Operation (SLDC)

Andhra Pradesh Wind Power Policy, 2015

GOVERNMENT OF ANDHRA PRADESH

ABSTRACT

ENERGY, INFRASTRUCTURE & INVESTMENT DEPARTMENT - Development of Wind Power in Andhra Pradesh –
Andhra Pradesh Wind Power Policy, 2015 - Orders – Issued.

ENERGY, INFRASTRUCTURE & INVESTMENT (PR.II) DEPARTMENT

G.O.MS.No. 9

Dated:13.02.2015

Read the following:

1. G.O.Ms.No.48, Energy (Res) Deptt., dated 11.04.2008.
2. G.O.Ms.No.99, Energy (Res) Deptt., dated 09.08.2008.
3. From the VC&MD, NREDCAP, Hyderabad Lr.No.NREDCAP/WE/Govt./2014, dated 25.09.2014.

Order

In order to promote Wind Power Projects, the Government of Andhra Pradesh have issued orders formulating Andhra Pradesh Wind Power Policy, 2012 vide references 1st and 2nd read above. The operative period of policy was 5 years and it expired in April, 2013, Considering, the good wind power potential existing in the State and to achieve 4000 MW capacity addition through wind power during the next 5 years period, there is a need to bring out comprehensive wind power policy.

2. Government, after detailed discussions on the proposal vide reference 3rd cited with various stakeholders viz., APTRANSCO., APDISCOMs, NREDCAP Wind Power Developers and Associations etc., hereby issue the Wind Power Policy, 2015 as mentioned below:

Preamble

India is amongst the largest wind power markets in the world. Wind power is already economical in comparison to conventional power sources and Andhra Pradesh has a huge wind power potential that is yet to be harnessed. The wind power potential in the combined state of Andhra Pradesh as estimated by the National Institute of Wind Energy (NIWE), formerly known as Centre for Wind Energy Technology (C-WET) is around 14,497 MW at 80 m level with maximum potential existing in the districts of Ananthapur, Kadapa, Kurnool, Chittoor and Nellore districts.

The Government of Andhra Pradesh has earlier issued “Wind Power Policy”, vide G.O.Ms.No. 48 dated 11.04.2008 and G.O.Ms.No. 99 dated 09.09.2008, to promote wind power projects. Since the policy operative period was for five (5) years, the policy expired in April, 2013. Taking into consideration the

rising power requirements of the State post bifurcation and clean energy considerations, the government of Andhra Pradesh is keen to promote wind power generation in a big way.

Objectives

1. To encourage, develop and promote wind power generation in the State with a view to meet the growing demand for power in an environmentally and economically sustainable manner.
2. To attract private investment to the State for the establishment of large wind power projects.
3. To promote investments for setting up manufacturing facilities in the State, which can generate gainful local employment.

1. Operative Period

The policy shall come into operation with effect from the date of issuance and shall remain applicable for a period of five (5) years and/ or shall remain in force till such time a new policy is issued.

Wind power projects that are commissioned during the operative period shall be eligible for the incentives declared under this policy, for a period of ten (10) years from the date of commissioning – unless the period is specifically mentioned for any incentive.

2. Eligible Developers

All registered companies, Joint Venture Companies, Central and State power generation/ distribution companies and public / private sector wind power developers will be eligible for setting up of wind power projects, either for the purpose

of captive/group captive use and/or for selling of electricity to the utilities or third parties, in accordance with the Electricity Act-2003, as amended from time to time.

The entity desiring to set up wind power project(s), either for sale of power and/or for captive use/group captive use of power within or outside the State, shall inform the Nodal Agency as per the para (9) of this policy.

3. Category of Wind Power Projects

Category I	Projects set up in government/revenue lands or forest areas or assigned lands and also in private lands selling power within the state.
Category II	Projects set up for captive use or group captive use/3rd party sale within or outside the state.
Category III	Sale of power at average power purchase cost and availing Renewable Energy Certificate (REC)

Category I: Projects set up in government / revenue lands or forest areas or assigned lands and also in private lands selling power within the State

Power generated from the wind power projects installed entirely or partly on government / revenue land or forest areas shall be for sale within the State only.

The Govt. of A.P. may consider proposals for allotment of revenue land if available - at the wind power potential areas on first come first serve basis- based on recommendation of NREDCAP, as per the provisions of New Land Allotment Policy announced by the Government vide G.O. Ms. No: 571, Dt: 14-09-2012 of Revenue (Assignment-I) Dept.

To facilitate faster execution of projects, the district collector shall handover advance possession of land including pathways to NREDCAP and the land shall be allotted in the joint name of NREDCAP and the Developer. The concerned district collector after taking into account all the necessary undertakings of land proposal shall permit the developer to start the construction. NREDCAP shall withdraw its rights from the land once the project gets commissioned.

In case of forest areas, the developers shall submit the application through the Nodal Agency to the forest department, to consider for allotment as per the guidelines/regulations laid down by the forest department from time to time.

If the wind farm is set up in private land then the Eligible Developer shall procure the land from the landholder on their own.

Category II: Captive use or group captive use /direct sale to 3rd party sale within the State/States other than A.P. State

The State will promote wind power producers to set up wind power projects with no cap on capacity for captive use/group captive or sale of power to 3rd party within the State/ States other than Andhra Pradesh. These projects will also qualify for Renewable Energy Certificates (RECs) subject to applicable regulations/ guidelines issued by the appropriate commission.

Category III: Projects under Renewable Energy Certificate Mechanism

The State will promote wind power producers to set up wind power projects with no cap on capacity for sale through Renewable Energy Certificate (REC) mechanism. The wind power producers will be required to apply for accreditation to the State Accreditation Agency and thereafter to Central Agency for registration and issuance of RE certificate under REC mechanism as per order/regulations of the appropriate commission. The power generated from these power projects shall be purchased by APDiscoms at pooled cost of power purchase as determined by APERC from time to time.

4. Capacity Allotment

The wind power projects shall be allowed in the areas notified by MNRE or in the areas where wind monitoring studies have been undertaken by MNRE/NIWE/NREDCAP/GoAP. In case wind resource assessment studies are proposed to be undertaken by the private developers, the capacity allotment will be considered only on submission of the wind data validation report of NIWE. The area applied for development of wind farm shall be clearly marked on a toposheet and google Map with the proposed capacity to be developed in that area.

NREDCAP shall be responsible for capacity allotment for upto 40 MW and to recommend capacity allotment beyond 40 MW to Government of AP.

5. Wind Resource Assessment studies in Private Sector

Permission for carrying out Wind Resource Assessment (WRA)and subsequent development at self-identified locations by the private entities will be given by the Nodal Agency on a first come first serve basis and will be governed by MNRE circular no. 51/9/2007-WE dated 20.06.2008 for wind measurement & subsequent development by private sector.

A large white Suzlon wind turbine with red and white striped tower and nacelle, set against a backdrop of a vast, arid desert landscape under a clear sky. The turbine's blades are partially visible, and the 'SUZLON' logo is prominently displayed on the nacelle.

Working harder today, for a greener tomorrow.

Please contact us at marketing.india@suzlon.com

World's fifth largest* wind turbine manufacturer with an installed capacity of over 21 GW | Operations in 33 countries across six continents | Manufacturing in four continents | R&D facilities in Denmark, Germany, India and The Netherlands

Source : *BTM Consult ApS - A part of Navigant Consulting - World Market Update 2012



Suzlon is the world's fifth largest* wind turbine manufacturer with installed capacity of over 21 GW of wind energy across the globe. While achieving outstanding availability, Suzlon is also committed to providing superior, efficient and customer focused wind solutions. Through its latest S9X turbine platform, Suzlon brings - cost-effective, robust and proven wind turbine technology to the world. Think of it as partnering with a company whose services are just as reliable as the energy it provides.

SUZLON
POWERING A GREENER TOMORROW

The applicant needs to clearly demarcate the project boundaries in a topo-sheet (scale 1:50000) where it is proposed to conduct the WRA study. All applications received will be scrutinised to ensure that the site identified has not been allotted to any other entity for WRA study as on the application date or is not within 5km radius from NIWE/NREDCAP proven or on-going wind masts as on the application date. Such WRA studies shall be completed within 24 months from date of signing of MoU with NREDCAP.

After completion of wind monitoring exercise, the applicant will be provided an exclusive period of 180 days from the expiry date of MOU to get the data authenticated by NIWE and make an application for capacity allotment. If the project is not applied for capacity allotment, the permission granted for private WRA study shall be cancelled. The applicant is also required to provide an undertaking to NREDCAP, with a copy to NIWE, indicating that NIWE can share the data to NREDCAP for subsequent/additional capacity allotments in the proposed (or balance) area.

6. Solar and Wind Hybrid Power Projects

To enable better utilization of common infrastructure and related facilities, solar and wind hybrid power projects shall be encouraged in the State. The tariff for such solar projects shall be as determined by APERC.

7. Repowering

The wind power developers will be encouraged to install higher capacity and improved technology Wind Electric Generators (WEGs) by undertaking appropriate micro-siting studies in order to optimally utilize the available wind resource potential at the project sites.

In respect of projects where lower capacity and lower hub height WEGs were installed and which have completed more than 15 years of life, proposals will be considered for replacing older turbines with higher capacity WEGs. In such cases, approval will be granted - subject to amendment of Power Purchase Agreement (PPA) with extension of time period for another 25 years.

The tariff payable for energy corresponding to the additional capacity available due to repowering of such projects shall be as per the applicable tariff determined by APERC from time to time.

8. GoAP Incentives

To enable wind power capacity addition in the State, following incentives shall be provided for Eligible Developers for those projects setting during the operative period mentioned in the para one (1).

a) Power Evacuation

- i. The Eligible Developer shall bear the entire cost of power evacuation facilities for interconnecting the wind farm with the grid.
- ii. The Eligible Developer shall abide by the orders, rules, regulations and terms and conditions as approved by APERC from time to time for operation of wind farms, power evacuation, transmission and wheeling of energy.
- iii. Wind power projects will be exempted from paying the supervision charges to APTransco/Discom towards the internal evacuation infrastructure within the wind farm site and upto pooling sub-station. All electrical installations within wind farm site and upto pooling sub-station shall be as per the statutory requirements and shall be certified by the Chief Electrical Inspector General (CEIG) or any other statutory authority.
- iv. APTransco/Discom will dispose the proposals for the technical feasibility for evacuation within 14 days from the date of receipt of application. Any upstream system strengthening requirement shall be borne by APTransco/Discom on a priority basis.

b) Transmission and Distribution charges for wheeling of power

There will be no Transmission and Distribution charges for wheeling of power generated from wind power projects, to the desired location/s for captive use/third party sale within the State through grid. However, the Transmission and Distribution charges for wheeling of power generated from the wind power projects for sale outside the State shall be as per regulations of APERC.

The 3rd party sale by Eligible Developers under this policy will be permitted only to HT – I category consumers as categorized in Tariff Orders and as per the regulations issued by APERC from time to time.

c) Energy Banking

Banking of 100% of energy shall be permitted during all 12 months of the year. Banking charges shall be adjusted in kind @ 2% of the energy delivered at the point of drawal. The banking year shall be from April to March.

Drawals from banked energy shall not be permitted during five (5) month period from 1st April to 30th June and 1st February to 31st March of each financial year. In addition, drawls of banked energy during the Time of the Day (ToD) applicable during the peak

hours, as specified in the respective Retail Supply Tariff Order, shall also not be permitted throughout the year. However, the provisions on banking pertaining to drawal restrictions shall be reviewed based on the power supply position in the State.

Energy injected into the grid from date of synchronization to Commercial Operation Date (COD) will be considered as deemed energy banking.

The unutilized banked energy shall be considered as deemed purchase by Discoms at the pooled power purchase cost as determined by the APERC for the applicable year. Energy settlement shall be done on monthly basis.

d) Open Access

Intra-state Open Access clearance for the whole tenure of the project or 25 years whichever is earlier will be granted as per the APERC Regulations amended from time to time. In absence of any response or intimation from the Nodal Agency to the generator within 21 days, then such application shall be considered to be deemed open access.

e) Electricity Duty

All wind power projects are exempted from paying Electricity Duty in case of sale of power to APDiscom.

f) Deemed Public Private Partnership (PPP) Status

Deemed PPP status shall be provided for projects coming up under Category I and have entered into a PPA with APDiscom for sale of power.

g) Non Agriculture Status

Deemed Non-Agricultural (NA) status for the land where wind power projects will be accorded, on payment of applicable statutory fees.

h) Deemed Industry Status

Generation of electricity from wind power projects shall be treated as eligible industry under the schemes administered by the Industries Department and incentives available to industrial units under such schemes shall be available to the wind power producers.

i) Must run status

Injection from wind power projects shall be considered to be deemed scheduled subject to prevailing regulations/grid code of appropriate commission.

j) Pollution Clearance

Wind power projects will be exempted from obtaining any NOC/Consent for establishment under pollution control laws from AP Pollution Control Board.

9. Nodal Agency

New and Renewable Energy Development Corporation of A.P. Ltd (NREDCAP) shall act as a Nodal Agency under this policy and as decided by the government from time to time.

The Nodal Agency and/or designated offices by the Nodal Agency shall be responsible for facilitating single window clearance of the projects for the following activities:

- a) Registration of projects
- b) Allotment of capacity of projects
- c) Processing of proposals for allotment of revenue land or Forest land.
- d) Arranging approval for power evacuation plan and open access.
- e) Arranging other statutory clearances/approvals if any.
- f) Co-ordination with MNRE/SECI/APTransco/APDiscoms and other central and state agencies.

An online system will be established by the Nodal Agency for acceptance of applications and for providing status updates. The developers will be given a login access for tracking the status updates. All approvals/clearances shall be disposed within 30 days from the date of registration.

10. Time Lines for Project Completion

The Eligible Developers should enter into a project agreement along with the applicable fees and bank guarantees with the Nodal Agency within two (2) months from the date of sanction of the capacity allotment.

In case of wind power projects allotted in revenue lands, the project shall be commissioned within 18 months from the date of possession of revenue lands and/ or issue of power evacuation clearance, whichever is later. In case of wind power projects allotted in private lands, the projects shall be commissioned within 18 months from the date of issue of power evacuation clearance.

In case of revenue and private lands, if there is no development at the site, even after three (3) years from the date of sanction, the site may be offered to any other developer by the Nodal Agency. The Nodal Agency would be at liberty to invite bids for setting up wind power projects in such sites, where no development is taken up within prescribed period. In such cases, the Government may

resume the lands so allotted or acquire the land purchased by the developers at the same price at which the sale deeds were registered and offer the lands to other developers by inviting bids.

11. Manufacturing

The Government intends to promote wind turbine manufacturing facilities that can contribute towards wind sector development in the State. The following incentives shall be applicable for new manufacturing facilities and equipment's, ancillaries related to wind power projects only.

- Priority allotment of Government land on long term lease basis
- Exemption from electricity duty for a period of ten (10) years for consumption of electricity from the first year of operation.

12. Applicability of this Policy for wind power projects approved under earlier Policy

This policy is applicable in respect of all wind power projects which are not commissioned as on date of notification of this policy in the State of Andhra Pradesh.

13. Project Monitoring

A "High Level Committee" constituted with the following members will monitor the progress of implementation of the Wind Power Policy:

1. Secretary, Energy Department
2. Chairman and Managing Director, APTRANSCO
3. CMD of APDISCOMs
4. V.C.& Managing Director, NREDCAP(Member-Convener)
5. Representative of Indian Wind Turbine Manufacturers Association (IWTMA)
6. Representative of Indian Wind Power Association (IWPA)

If any difficulty arises in giving effect to this policy, the High Level Committee is authorized to issue clarification as well as interpretation to such provisions, as may appear to be necessary for removing the difficulty either on its own motion or after hearing those parties who have represented.

14. Mid-term Review

State Govt. may undertake a Mid-term Review of this policy after a period of two years or as and when need arises in view of any technological breakthrough or to remove any inconsistency with Electricity Act 2003, rules and regulations made there under or any Govt. of India policy.

15. Power to remove difficulties

If any difficulty arises in giving effect to this policy, energy department is authorized to issue clarification as well as interpretation to such provisions, as may appear to be necessary for removing the difficulty either on its own motion or after hearing those parties who have represented for change in any provision.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

AJAY JAIN

SECRETARY TO GOVERNMENT

To

The Vice Chairman & Managing Director, NREDCAP, Hyderabad.

The Chairman & Managing Director, APTRANSCO, Hyderabad

The Managing Director, APGENCO, Hyderabad.

The Secretary, APERC, Hyderabad

The CMDs, of APSPDCL, Tirupathi / APEPDCL, Visakhapatnam.

All Collectors & District Magistrates in the state.

The Principal Secretary to Government, EFS&T Department.

The Principal Secretary to Government, Revenue Department.

The Principal Secretary to Govt., Finance (PF.I) Department.

Copy to:

The Secretary to Hon'ble C.M.

The P.S. to Hon'ble Dy. Chief Minister, Revenue, Stamps & Registrations.

The P.S. to Hon'ble Minister for Finance, Planning, Commercial Taxes & Legislature Affairs.

The P.S. to Secretary, Energy, I&I Department.

SF/SC.

//FORWARDED BY ORDER//

SECTION OFFICER



BEFORE THE TAMIL NADU ELECTRICITY REGULATORY COMMISSION CHENNAI

Order No. 2 of 2015, dated 19-02-2015

Present : Thiru. S. Akshayakumar, Chairman

Thiru S. Nagalsamy, Member

Thiru G. Rajagopal, Member

In the matter of : Interest on Security Deposit from consumers for the Year 2014-15 – Ordered.

- 1) As per sub-section (4) of Section 47 of Electricity Act 2003, the Distribution Licensee shall pay interest equivalent to the bank rate or more as may be specified by the Commission on the security in respect of electricity supplied to the consumers as well as for the meter provided to the consumers.
- 2) As per Regulation 5(5)(i) of the Tamil Nadu Electricity Supply Code, rate of interest on Security Deposit shall be on the basis of the Commission's direction.
- 3) As per Regulation 5(5)(iii) of the Tamil Nadu Electricity Supply Code, the interest at Bank Rate or more as specified by the Commission shall be calculated and credited to the Security Deposit Accounts of the consumers at the beginning of every financial year and the credit available including the interest shall be informed to each consumer before the end of the year.
- 4) The weighted average Bank rate for the period from April 2014 till March 2015 is 9%.
- 5) The Commission directs that the TANGEDCO shall pay interest at 9% on the Security Deposit from the consumers for the year 2014-15. The interest on Meter Caution Deposit shall be 9% as per the Commission's Order on Non-Tariff related miscellaneous charges.
- 6) The credit including interest available in the accounts of the consumers as on 31-03-2015 shall be intimated to the consumers by 30-06-2015.

(By order of the Commission)

To

The Chairman cum Managing Director,
Tamil Nadu Generation & Distribution Corporation Ltd,
144, Anna Salai, Chennai 600 002.

Sd/-
Secretary

Tamil Nadu Electricity Regulatory Commission

KERC Revised Tariff Order dated 24.02.2015

Before the Karnataka Electricity Regulatory Commission Bangalore

Dated 24th February, 2015

Present:

1. Sri M.R.Sreenivasa Murthy - Chairman
2. Sri H.D.Arun Kumar - Member
3. Sri D.B.Manival Raju - Member

In the matter of determination of tariff for Wind Power Projects

Preamble:

1. In exercise of its powers under sections 61, 62 and 86 of the Electricity Act, 2003, read with the KERC (Procurement of Energy from Renewable Sources) Regulations, 2011, this Commission had issued orders on 10th October, 2013 in OP Nos. 19, 36 & 43/2012 approving the tariff for Wind Energy at Rs. 4.20 /kWh. The said order was made applicable for power purchase agreements signed during the period of five years from the date of the order. Aggrieved by the above orders of the Commission, M/s Gutta Seema Wind Energy Co. Pvt. Ltd., M/s Indian Wind Power Association and M/s Indian Wind Turbine Manufacturers Association had filed appeal Nos. 82/2014, 11/2014 and 49/2014 respectively before the Hon'ble Appellate Tribunal for Electricity (ATE) on various grounds. The Hon'ble ATE, in its order dated 25th November, 2014 has allowed the appeals in part and remanded the matter to this Commission for redetermination of tariff with the following directions.

- i) To re-determine tariff on levelised basis for the useful life of the project / the entire period of PPA using a discount factor.
- ii) To reconsider the capacity utilization factor (CUF) after considering any scientific study or supporting data available for the State from C-WET or any other reliable data or based on actual wind energy generation data available with the distribution licensees for the existing wind generators for different areas of the State and the Regulations and object and reasons of the Regulations of the Central Commission.
- iii) To follow the Central Commission Regulations for depreciation for the period beyond 10 years while determining levelised tariff for the life of the project/ PPA period.
- iv) To reconsider O & M expenses and to give proper reasoning if a value different from that adopted by the Central Commission is being considered.

v) To reconsider the issue and decide capital cost indexation mechanism for determining the capital cost for the control period or alternatively to carry out the exercise every year to determine the capital cost for the following year keeping in view the prevailing prices.

vi) To clarify interconnection point at which tariff determination takes effect.

2. In the above context, the Commission issued notices to the parties in appeal before the Hon'ble ATE and also a notice in newspapers on 19th December, 2014 for conducting a public hearing. A public hearing in the matter was held in the Court Hall of the Commission on 7th January, 2015. The names of participants who made their submissions before the Commission during the public hearing are listed in the Annexure to this order.

3. In the light of the directions of the Hon'ble ATE in its order dated 25th November, 2014 and after considering the comments / views/ suggestions submitted by the stakeholders and other interested persons during the public hearing, the Commission makes the following analysis on the issues to be decided in the present case:

a) Levelized tariff

4. During the public hearing, Sri Sridhar Prabhu, Counsel appearing for M/s Gutta Seema Wind Energy Co. Pvt. Ltd. (GWECP), has submitted that, as per the judgement of the Hon'ble ATE in Appeal No.82/2014 dated 25th November, 2014, the tariff should be determined on a levelised basis by applying a discount factor for the time value of money. Sri Vishal Gupta, Counsel appearing on behalf of M/s. Indian Wind Power Association (IWPA) and M/s. Indian Wind Turbine Manufacturers Association (IWTMA) has submitted that, since the Hon'ble ATE has directed to adopt levelised tariff for the life of the plant / term of PPA, the Commission is required to choose an option between working out the tariff for the life of the plant or for the term of the PPA. He

suggested to fix a levelised tariff after calculating the costs of the project for twenty five years (life of wind generation projects) out of which the levelised costs of twenty years may be taken for determining the tariff for the term of the PPA. In the alternative, the tariff may be determined for 25 years (useful life of projects). Further, he agreed with the concept of applying a discount factor based on the weighted average cost of capital. He also suggested that, as per the provisions of the Section 86(1)(e) of the Electricity Act, 2003, the Commission is required to determine tariff for renewable sources of energy that would attract investments in the State and the tariff should be comparable with the tariffs determined by other SERCs.

b) Capacity Utilisation Factor (CUF):

9. On behalf of IWPA and IWMTA, Sri Vishal Gupta has submitted that as per the data furnished by the National Institute of Wind Energy (NIWE), formerly C-WET, the Capacity Utilisation Factor (CUF) assessed on the basis of data from the wind monitoring stations in eight major wind potential districts of Karnataka ranges from 25% to 32% at a hub height of 50 meters. The following table is furnished by him in the written submissions to the Commission:

Details as per C-WET					
S. No.	Major Wind Potential District	Mast Height Measured (M)	Wind Mast Elevation (M)	WPD Extrapolate / Measured at 50	CUF Assessed
1	Chitradurga	20-80	1132-599	632-131	32%-20%
2	Chickmagalur	20	1830	581	32%
3	Bellary	25	10260-849	286-284	25%
4	Belgaum	20-25	923-730	336-283	30%-25%
5	Gadag	25	976-786	652-423	32%
6	Koppal	20	722-709	335-270	30%-25%
7	Bagalkot	20	619	259	25%
8	Dharwar	20	705	268	25%

10. It is further submitted on behalf of M/s. IWPA and IWMTA that in the eight potential districts mentioned above, the total installed capacity during the last several years has been only 2,041.01 MW as against 8,132.97 MW capacity allotted for wind projects. It is further stated that all the potential wind sites in the State of Karnataka which were assessed at CUF ranging from 25 % to 30 % are exhausted and most of the remaining sites cannot be utilised as they are identified as forest areas, wild life sanctuaries, etc. As per details furnished by IWPA, the District wise capacity allocated, commissioned and balance to be commissioned in seven districts of the State are as follows:

Figures in MW

Sl. No	Name of the District	Avg CUF	Capacity allocated	Capacity Cancelled	Capacity Commissioned	Capacity yet to be Commissioned
1	Chitradurga	23.64	1508.66	130.22	524.56	853.88
2	Bellary	24.39	588.50	31.35	153.70	403.45
3	Davangere	26.38	1064.95	56.80	298.10	710.05
4	Belgaum	21.15	1912.25	297.95	300.60	1313.70
5	Gadag	21.13	1110.78	38.13	560.11	512.54
6	Tumkur	20.95	441.00	255.60	60.80	124.60
7	Haveri	18.31	369.23	0.00	204.00	165.23
	TOTAL	22.28	6995.37	810.05	2101.87	4083.45

5. Sri Thiruvengadam, counsel appearing on behalf of ESCOMs supported adoption of levelized tariff for 25 years as the same takes into account the time value of money.
6. The Commission had in its earlier orders adopted the method of determining average costs for the first ten years of the project with the resultant tariff being applied for the remaining ten years of the power purchase agreements. For the purpose of adopting the method of determining levelised tariff, the Commission needs to adopt a discount factor reflecting the time value of money. The Commission considers it appropriate to adopt the weighted average cost of the capital based on a normative debt equity ratio of 70:30 as the discount factor. The written submissions made on behalf of M/s. IWPA and IWMTA have also indicated their view in support of adopting the above approach to arrive at the discount factor.
7. The rate of interest of term loans considered in the Commission's order of 10.10.2013 at 12.3% and the return on equity at 16% have not been disputed by any of the parties. However, the Commission in its recent orders on Generic Tariff for other renewable sources issued on 1.1.2015 adopted the current rate of interest on term loan at 12.5%. Applying the same rate and based on the weighted average of the rate of interest and return on equity, the discount factor to be adopted for 25 years works out to 13.55%.
8. On the issue of the duration of levelised tariff as to whether it should be for the useful life of the plant (25 years) or for the term of the PPA (20 years), the Commission agrees with the stakeholders' view that the tariff may be levelised for 25 years and implemented for a term of PPA of 20 years. This approach provides for spreading the costs of the project over 25 years with an option to the generator to either continue with the PPA for the next five years or opt for open access, for third party sales.

The Commission therefore decides to adopt levelized tariff for the useful life of the plant i.e., 25 years with a discount factor of 13.55% per annum.

11. Sri Vishal Gupta has also submitted a statement relating to generation recorded during the last four years in 30 pooling stations with an attached capacity of 1,554 MW which has yielded a combined CUF of 22.36%. This statement however does not include a break up of wind projects according to the year of commissioning and the hub height even though these two factors can significantly influence the CUF of the projects in view of the different level of technology adopted in the projects established at different points of time and the higher wind potential known to exist with increased hub heights. According to the written submissions made by the above parties, the future availability of potential wind project sites may have an average CUF between to 22% and 24% as per a study of NIWE quoted by them. In view of the above data, it is prayed by them that the CUF for determination of tariff in the present case should be fixed at 22.28%. Sri Vishal Gupta agreed that while determining the average CUF for the State, the CUF values of below a certain level may be excluded as installation of generating units in locations with very low CUF is not feasible at the present juncture.
12. Sri Sridhar Prabhu has suggested adoption of CUF based on data to be obtained from distribution companies and other sources as per the directions of the Hon'ble ATE.
13. M/s Green Infra in their letter received on 7.1.2015 have requested to assume a CUF of 22%. The Wind Independent Power Producers Association (WIPPA) has requested to adopt a CUF of 21% to 22%.
14. Sri G.S.Kannur, appearing on behalf of KREDL, has submitted the details of CUF in respect of new wind power projects with hub heights ranging from 50 to 95 meters allocated by KREDL for the period FY12 to FY15. The CUF values indicated by promoters in these cases range from 24.25% to 37.20%. He has informed that this CUF data is based on the submissions of project developers in their detailed project reports (DPR) furnished to KREDL for allocation of the projects. As per the data submitted on behalf of KREDL, the district wise range of CUF of these proposed projects is as follows:

Name of the District	No. of projects	Range of CUF
Raichur	3	29.28 to 35.80
Koppal	1	26.62
Gadag	3	24.25 to 34.00
Chitradurga	4	31.05 to 37.20
Haveri & Dharwad	2	24.25
Davanagere & Bellary	3	24.25 to 31.50
Belgaum	6	25.80 to 31.50
Yadgir	1	27.97
Tumkur	1	27.90
Bijapur	4	25.10 to 31.00

15. The CUF indicated by promoters at 55 mts. hub height plants averages 24.25% while at 80-95 mts. hub height plants indicate CUF in the range of 26.62% to 37.20%. As seen from the above data, with higher hub heights, the CUF recorded is generally more than 26%. Further, KREDL has submitted that the actual installed capacity commissioned in the State as on June, 2014 is 2501.49 MW out of the allocated capacity of 10454.83 MW and the estimated potential of 22374 MW in the State. The balance capacity to be commissioned out of the allotments made is 7953.34 MW.
16. The Commission has perused the data regarding the wind power potential published by NIWE on its website, as also the data on the performance of wind power plants established during the last 3 – 4 years submitted by various distribution utilities.

National Institute for Wind Energy:

17. The Commission notes that the National Institute for Wind Energy (NIWE) has indicated different wind zones in the State based on Wind Power Density (WPD). This data is available for 50 meter hub heights. According to the data published on their website, the following districts have sites with wind generation potential as indicated:
 - 1) Bagalkot CUF ranging between 20 and 25%
 - 2) Belgaum CUF 20 to 30%
 - 3) Bellary CUF 20 to 25%
 - 4) Bijapur CUF 20 to 22%
 - 5) Chitradurga CUF between 20 to 32%
 - 6) Dharwar CUF 20 to 25%
 - 7) Gadag CUF 20 to 32%
 - 8) Koppal CUF 20 to 30%
 - 9) Chickmagalur CUF 32%

The remaining districts in the State like Bidar, Bangalore Urban, Chikkaballapur, Hassan, Tumkur and Uttara Kannada have wind sites indicating a potential of about 20% CUF.

Generation data for FY12-14 from ESCOMs:

18. The tariff now being determined by the Commission will relate to the projects recently established and to be established in the future with the control period starting in October, 2013. The Commission has therefore examined the actual generation data from the wind power plants (WPPs) established in the recent past of 3 – 4 years having PPAs with different ESCOMs.
19. The data submitted by Bangalore Electricity Supply Company Limited (BESCOM) of the recently established units having

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PPAs with it relates to eleven units, ten of which were established in the year 2011. These units are located in the districts of Chitradurga (1), Gadag (3), Davangere (5) and Belgaum (2). Except one unit in Gadag district which has a hub height of 55 mtrs., all the others have a hub height of over 80 mtrs. The average CUF achieved by them during 2012-13 was 24.84 % and during 2013-14, 24.47 %.

20. The data submitted by Hubli Electricity Supply Company Limited (HESCOM) relates to twenty one units all of which have a hub height of 56 mtrs. or below except for one unit. These units are located in the districts of Haveri (16), Belgaum (3) and Gadag (2). The average CUF of these units works out to 21.03 % in 2013-14.
21. The data relating to 13 units established in the year 2011-12 has been submitted by Gulbarga Electricity Supply Company Limited (GESCOM). These units are located in Bellary district (7), Raichur district (1) and Koppal district (5). Their average CUF in 2011-12 is 26.34 % and that in 2013-14 is 28.64 %. The hub heights of these plants are not indicated in the data furnished.
22. Mangalore Electricity Supply Company Limited (MESCOM) has submitted data of 10 units established in 2011-12, all of which are located in Shimoga district. They have hub heights ranging between 53 mtrs. and 80 mtrs. The average CUF achieved by them is 27.27 % in 2013 and 26.86 % in 2014.
23. Chamundeshwari Electricity Supply Corporation Limited (CESC) has submitted data relating to 10 units established in 2011-12, all of which are located in Hassan district. The CUF achieved by these units is 19.84 % in 2011-12 and 19.61 % in 2012-13. All the 10 units in this case are of hub height of 80 mtrs.
24. As has already been pointed out, the Commission has to determine a viable tariff for the wind energy generating units established / to be established during the control period of five years commencing from 10th October 2013. It is well known that with the advancement of technology and infrastructure facilities, the present trend in the industry is to install generating units with hub heights of 80 mtrs. and above to ensure better performance in view of the higher wind power density at higher elevations. The data relating to the performance of generating units attached to thirty pooling stations relied upon by IWPA and IWTMA shows the performance of units established over a period of more than 15 years and includes units incorporating technology at different stages of improvement during these years. Further, the average hub height of these units is closer to 50 mtrs. which was the general standard prevailing till about 2010. The units to be established in the future as confirmed by the data submitted by KREDL generally incorporate more productive technology and have hub heights of 80 mtrs. and above. Viewed from this point, the data relating to CUF

of recently established plants submitted by ESCOMs is a better indicator of the performance of units to be established during the control period. The average CUF of the recently established units having PPAs with ESCOMs in the northern districts of Bellary, Gadag, Koppal, Raichur and Gulbarga as also the southern districts of Chitradurga and Shimoga is generally above 26%, whereas the southern districts of Hassan, Bangalore, etc., have a CUF of 22 % and below.

25. The Commission is aware that, the wind energy generation units so far established in the State are all concentrated in the districts which have a high wind power density as indicated by the potential assessed by NIWE. We have also noted the submission made on behalf of IWPA and IWTMA that very low CUF values indicated for certain parts of the State need not be considered as it may not be feasible to establish wind energy units in such areas. Further, the Commission is also aware of the high cost of power generation for units that may be established in low CUF areas which will necessitate fixing of a high tariff to make such units viable. This would in turn impact on the consumer tariff in the State, passing on the burden to the consumers.
26. The Commission has noted that the cost of wind energy as claimed by the Indian Wind Power Association itself is about Rs.3 and 4 per kwh. In this respect, the Commission has noted the letter dated 15.7.2014 from the Chairman of Indian Wind Power Association addressed to the Hon'ble Finance Minister, Government of India, wherein the Chairman, IWPA has made the following statement :

"Wind energy at Rs.3 to 4 per kwh is much cheaper than the power purchased from the grid. Cheap wind energy enables MSME sector in India to produce goods at a much competitive cost enabling exports that compete with Chinese manufacturers and earn precious foreign exchange" (Reference Page-3 of Issue 7, Volume II – Windpro Magazine published by Indian Wind Power Association National Council, July, 2014).
27. The President of the Indian Wind Power Association had stated that "Wind Energy besides being pollution free and environmental friendly, is cheap at Rs.3 to 4 per kwh" in another letter published in the same journal in May, 2014.
28. For the cost of wind energy to be within about Rs.4.00 per kwh, it is necessary that development of wind energy is concentrated in areas with high wind power density for the present.
29. **Keeping the above factors in view the Commission decides to adopt a CUF of 26% as the norm for determining tariff for the wind energy units to be established during the present control period.**

c) Capital Cost

30. On the question of capital cost to be adopted, on behalf of IWPA and IWMTA, Sri Vishal Gupta has submitted that the wholesale price index for electrical machinery and steel is increasing year on year, as is evident from the data for the period 2011-14. He has suggested adoption of fixed capital cost of Rs.6.10 Crores / MW for the entire control period or to adopt a capital cost indexation mechanism as per CERC Regulations. He has further clarified that Rs.6.10 Crores/MW is the average capital cost for five years duly incorporating indexation on the base value of Rs.5.75 Crores for the first year. On the Commission's suggestion, IWPA also has furnished information on the capital cost incurred on the following projects :
 - i) M/s Acciona-Tuppadahalli Energy India Pvt. Ltd., at Rs.600.75 lakhs with hub height of 85 meters.
 - ii) M/s Mytrah Vayu (Krishna) Pvt. Ltd., at Rs.596.24 lakhs with hub height of 65 meters.
31. Sri Sridhar Prabhu has suggested adoption of indexation while deciding on the amount of capital cost for each year of the control period as per the directions of the Hon'ble ATE. He has also suggested to include cost of the line / sub-station, if any, up to the interconnection point in the capital cost. Sri Thiruvengadam, Advocate representing the ESCOMs has suggested that capital cost data as certified by cost accountants needs to be considered. He has also opined that any goodwill / premium on shares should also be taken into account.
32. As per the data furnished by KREDL during the public hearing, based on the information contained in the project reports submitted by promoters, the capital cost of plants with 55 mts hub height is about Rs.550 Lakhs/MW while the capital cost of 80-95 mts hub height plants is in the range of 628 Lakhs/ MW to 819 Lakhs /MW. It is evident from the data of the proposed plants that, higher values CUF are associated with plants of higher hub heights which are also expensive compared to plants with 50 meter hub height. However, it is to be noted that these expensive plants also provide higher energy output.
33. The Hon'ble ATE in its Order dated 25th November, 2014 has directed this Commission to consider capital cost indexation mechanism or in the alternative determine the tariff every year taking into account the prevailing capital cost of wind energy units. Further, the Hon'ble ATE has rejected the contention of the appellants on the issue of separately considering the cost of evacuation infrastructure and foreign exchange variation.
34. The Commission has examined the feasibility of indexing the capital cost for the purpose of determining tariff for the control period. It is felt that adopting the method of indexation on the basis of the prevailing rate of inflation may result in the

capital cost getting unduly inflated over the control period. The Commission notes that the capital costs in respect of same renewable energy technologies tend to decline over the years due to more efficient technologies becoming available. This phenomenon has been most marked in the case of solar energy where the capital cost per MW has declined from more than Rs.16 crores per MW in 2010 to about Rs.7 crores per MW at present, i.e., in less than five years. Even in the case of wind energy the international trend in the cost of machinery indicates a moderate decline / stagnation during the recent years. The Commission has noted this trend in the market studies discussed below:

- 1) India Infrastructure Research in its Report on "Wind Power in India 2014-15" issued in January 2015 (Page 152) has analysed the capital costs of some of the completed wind power projects in the country including Karnataka State during 2012-13, 2013-14 and 2014-15. This market analysis indicates the average capital cost for the last three years i.e., FY13-FY15 at Rs.612 Lakhs/MW with the capital cost varying from Rs.520 to Rs.706 lakhs/MW. The report also indicates that the average cost has not changed substantially in these years.
- 2) The International Renewable Agency (IRENA) in its report on "Renewable Power Generation Costs in 2014" (Page 60-64) issued in January, 2015 has observed that the global capital costs of wind power plants are on a declining trend. The report points out that with improved technology, higher hub heights and larger rotor diameter, higher energy output is evident. It is observed that the capital costs in India are fractionally higher in 2014 as compared to costs in 2010 and has broadly remained stable.
35. The Commission has also considered the submissions made on behalf of IWPA and IWMTA that an average capital cost could be adopted for the entire control period keeping the general trend of variation in the price of plant and machinery and other factors.
36. The Commission in its order dated 10th October, 2013 had considered capital cost of Rs. 560 Lakhs for the entire control period. Considering the fact that there is not much change in capital costs in the last three years, the Commission decides to reckon the annual increase in the capital cost over the control period at about three per cent instead of adopting the higher rate of general inflation. In the above context, reckoning a capital cost of Rs. 560 lakhs/MW for FY14 and with an annual increase of 3% per annum, the capital cost for FY18 will be Rs. 630 lakhs/MW. The average capital cost for the control period works out to Rs. 595 lakhs/MW, which may be rounded off to Rs. 600 lakhs/MW. Further, the Commission notes that the cost of two plants furnished by the petitioners is also around 6.00 crs/MW.

The Commission therefore decides to adopt capital cost of Rs.600 lakhs/MW in order to have a common tariff for all the projects to be commissioned during the control period.

d) O & M expenses

37. The Commission in its order dated 10th October, 2013 had adopted O & M expenses of Rs.7 lakhs/MW i.e. 1.25% of the capital cost with an annual escalation of 5%. The CERC in its Regulations has provided O & M expenses of Rs.9 lakhs / MW for the period 2012-13 to be escalated at 5.72% over the tariff period to compute the levelized tariff.
38. Sri Sridhar Prabhu, Counsel for M/s. GWECPL has requested the Commission to reconsider the O & M expenses as directed by the Hon'ble ATE and increase the same. Sri Vishal Gupta has submitted that 2% of capital cost may be allowed as O&M expenses with 5.72% escalation annually. He has requested the Commission to give reasons if the approach adopted is different from the norms as per the CERC Regulations.
39. During the public hearing, the Commission requested IWPA to furnish data of the actual O&M expenses incurred in respect of three to four wind power generators in the State for the last three years duly supported by vouchers. IWPA in its additional submissions received on 16th January, 2015 has furnished the O&M expenses incurred by various generators as follows:
 - i) M/s Acciona-Tuppadahalli Energy India Pvt. Ltd., @ Rs. 11.43 to Rs. 11.96 lakhs / MW.
 - ii) M/s Mytrah Vayu (Krishna) Pvt. Ltd., @ Rs. 9.87 lakhs / MW.
 - iii) M/s Sterling Agro Industries, Shimoga @ Rs. 9.01 lakhs/ MW.
 - iv) M/s Sterling Agro Industries, Davanagere @ Rs. 9.23 lakhs /MW.
40. As seen from the above, O&M expenses vary with the type and location of the plant besides its vintage. Considering the views expressed by the stakeholders and the data furnished by IWPA, the Commission decides to adopt O&M expenses as per CERC Regulations.

Hence, the Commission decides to consider O & M expenses of Rs. 9.51 lakhs / MW for the year 2013-14 to be escalated at 5.72% over the tariff period to compute the levelized tariff.

e) Depreciation

41. On depreciation, adoption of CERC Regulations as directed by the Hon'ble ATE is favoured by the counsel for GWECPL. Sri Vishal Gupta has also suggested to allow depreciation of 5.83% for first twelve years to enable debt servicing to be completed during that period.

42. The Commission in its Order dated 10th October, 2013 had considered depreciation of 5.83% for the first 10 years. The Hon'ble ATE in its order dated 25th November, 2014 has directed to adopt depreciation duly following CERC Regulations for the period beyond 10 years. Since the Commission has decided to adopt levelised tariff for the useful life of the plant instead of average tariff for 10 years, it is of the view that allowing depreciation at 5.83% / annum on capital cost during the first 12 years would enable the investor to repay the entire loan amount. The remaining capital cost after deducting the normative cost of land at 5% of capital cost and salvage value of plant at 10% of the plant cost, is spread over the balance period of the useful life of the plant.

Therefore, the Commission decides to adopt the rate of depreciation at 5.83 % p.a. during the first 12 years and 1.20 % p.a. for the next 13 years.

f) Inter connection / delivery point

43. Sri Sridhar Prabhu has requested the Commission to provide clarity on the inter-connection point as the same has financial impact on the investments to be made by the developers.
44. The Commission notes that, the interconnection point / delivery point has already been clearly defined in the Power Purchase Agreements and the Commission is of the view that there is no need to clarify the matter further.
45. Based on the above decisions of the Commission and the other parameters approved in Commission's Order dated 10th October, 2013, the following is the abstract of the parameters considered for determination of tariff:

Particulars	Values adopted Category-B projects
Capital Cost/MW- Rs. Lakhs	600
Debt: Equity Ratio	70:30
Debt-Rs. Lakhs/MW	420
Equity- Rs. Lakhs/MW	180
Debt Repayment Tenure in Yrs.	12
Interest charges on Debt	12.50%
Capacity Utilisation Factor (CUF)	26%
Return on Equity	16%
Discount Factor	13.55%
Auxiliary consumption	0.5%
O & M expenses in Rs. Lakhs per MW	9.51
O & M expenses' Escalation p.a.	5.72%
Working Capital	2 months receivables
Interest on Working Capital	13.00%
Depreciation for first 12 years	5.83%
Depreciation for next 13 years	1.20%

46. Using the above parameters, the levelled tariff for wind energy projects works out to Rs.4.49 per kwh rounded off to Rs.4.50 per kwh, taking into account the life of the project at 25 years. The Commission therefore determines the tariff for wind energy projects, as follows :

ORDER

47. (i) In modification of the earlier order dated 10th October, 2013, the Commission hereby redetermines the tariff for wind power projects at Rs.4.50 per kwh for projects established during the control period of five years commencing from 10th October, 2013.
- (ii) This tariff shall be applicable to all the new wind power projects entering into power purchase agreements (PPA) on or after 10.10.2013 for the control period of five years from that date.
- (iii) In respect of the projects which have already entered into PPAs with ESCOMs from 10th October, 2013 and up to the date of this Order, the tariff as determined in this Order shall be applicable.
48. This order is signed, dated and issued by Karnataka Electricity Regulatory Commission on this 24th day of February, 2015.

Sd/-

(M.R. SREENIVASA MURTHY)
CHAIRMAN

Sd/-

(H.D. ARUN KUMAR)
MEMBER

Sd/-

(D.B. MANIVAL RAJU)
MEMBER

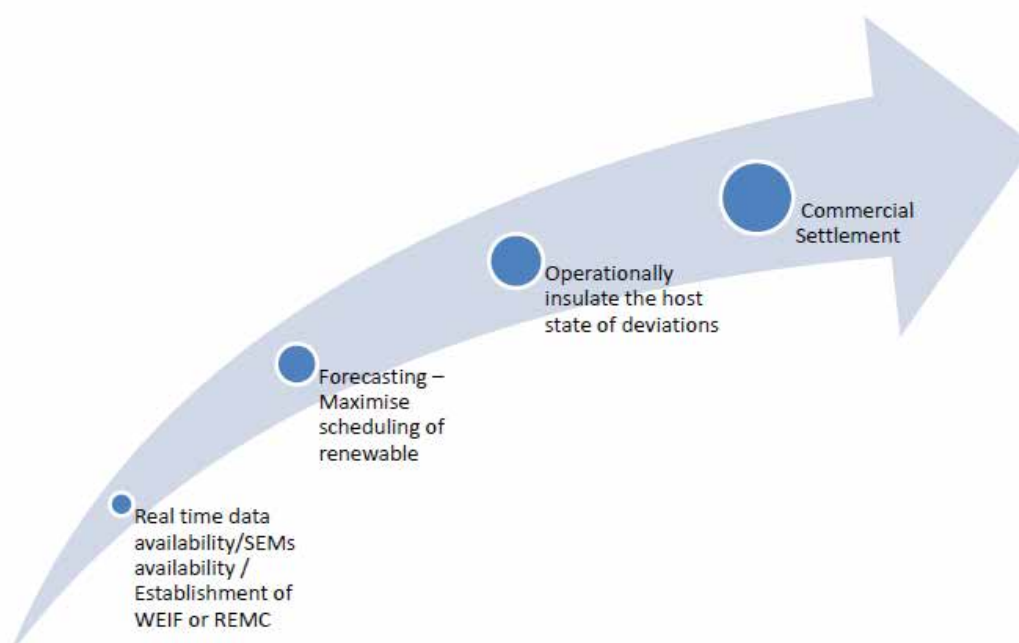
Annexure:

List of Persons who made submissions before the Commission in the Public hearing

1. Sri Sridhar Prabhu, Counsel representing Guttaseema Wind Energy Company Pvt. Ltd.,
2. Sri Vishal Gupta, Counsel for Indian Wind Power Association & Indian Wind Turbine Manufacturers Association.
3. Sri Prabhat WIPPA
4. Sri G.S. Kannur, Counsel for KREDL
5. Sri Manish Verma, InWEA
6. Sri Thiruvengadam, Counsel for ESCOMs

Way forward

(Gist of IWPA's Presentation to SRPC)



ESS Feasibility Study in Tamil Nadu

Challenges in Wind Power

- Infirm, variable and intermittent and available only for 4 months (June-September)
- 10 to 15% of wind output gets curtailed.
- Threatening to the system security - Wide variability & intermittency affects the grid stability, security & economic operation.
- No spinning reserve to meet out sudden loss of huge wind power.
 - ✧ Maximum realization of wind generation - 4318 MW
 - ✧ Intra day variation up to 3000 MW
- Conventional Hydro source available - only 20%.
 - ✧ Irrigation : 912 MW
 - ✧ Non Irrigation : 1325 MW
- No storage device to trap the sudden increased availability.
- Makes the grid operation difficult in maintaining the grid discipline as per Grid Code

Source: CEA

ESS – Technologies and Applications

ESS Technologies

EES Technology	Advantages	Disadvantages
Lead Acid	<ul style="list-style-type: none"> • Mature technology – over a century old • Familiar – the most widely-used electricity storage system on earth • Relatively inexpensive • Ready Availability (45-50% of battery sales) 	<ul style="list-style-type: none"> • Low specific energy and specific power • Short Cycle life • High maintenance requirements • Environmental hazards (lead and sulfuric acid) • Capacity falls sharply when temperature is below 77oF
Sodium Sulfur (NAS)	<ul style="list-style-type: none"> • High energy and power density • Relatively high efficiency • Long cycle life • Relatively well-established 	<ul style="list-style-type: none"> • Relatively expensive (still small volume manufacturing) • High temperature produces unique safety issues
Vanadium Flow Redox Batteries (VRFB)	<ul style="list-style-type: none"> • Energy and power sizing is independent • Scalable for large applications • High energy and power density 	<ul style="list-style-type: none"> • Relatively early-stage technology • Relatively expensive • Limited opportunities for standard sizes
Zinc Bromine Flow Battery (ZBB)	<ul style="list-style-type: none"> • Energy and power sizing is partially independent • Scalable for large applications • High energy and power density 	<ul style="list-style-type: none"> • Relatively early-stage technology • Potentially high maintenance costs • Safety hazard: corrosive and toxic materials require special handling
Li-ion	<ul style="list-style-type: none"> • High energy and power density • High efficiency • Commercially proven 	<ul style="list-style-type: none"> • Requires sophisticated battery management • Safety issues

EES Technology	Advantages	Disadvantages
Ni-Cd	<ul style="list-style-type: none"> • Mature technology • Relatively rugged • Higher energy density and • Better cycle life than lead-acid batteries 	<ul style="list-style-type: none"> • More expensive than lead-acid • Limited long-term potential for cost reductions due to material costs • Toxic components (cadmium)
Ultracapacitors	<ul style="list-style-type: none"> • High power density • High cycle life • Quick recharge 	<ul style="list-style-type: none"> • Low energy density • Expensive • Sloped voltage curve requires power electronics

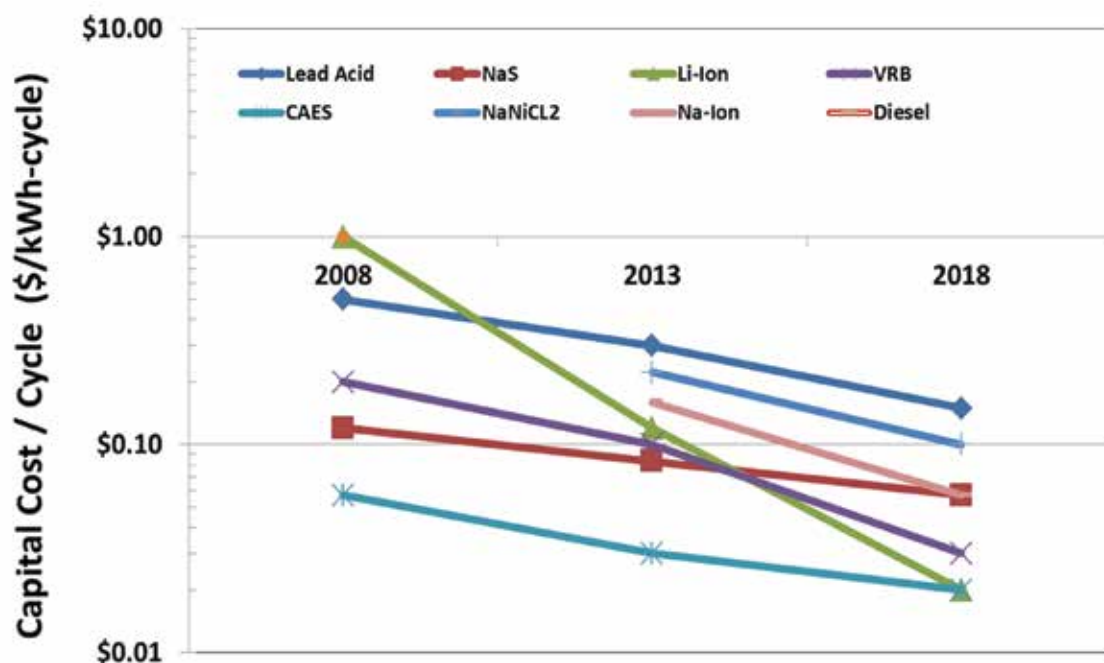
Applications and Technologies Mapping

Segments / Applications	Sub Segments	Power Rating	Duration	DOD	Type of cycles	No of cycles / Year
Renewable Energy Integration	Wind Smoothing	1 MW- 20 MW	15 min - 1 Hr	<60%	Shallow	10,000-18,000
	Wind Firming	1 MW-20 MW	4-6 Hrs	>80%	Deep	250-500
	Solar	3 KW-2 MW	3-6 Hrs	>80%	Deep	250-350
Load shifting or energy arbitrage	Commercial	10 kW - 2 MW	2-4 Hrs	>80%	Mix	200-400
	Industrial	500 kW - 5 MW	2-4 Hrs	>80%	Mix	200-400
Off grid applications	Rural Microgrid (households)	1KW - 5 kW	2-8 Hrs	>80%	Mix	200-400
	Rural Schools / Hospitals	1 KW - 10 kW	2-8 Hrs	>80%	Mix	200-400
Replacement of DG	Telecom Towers	2 kW - 5 kW	2-4 Hrs	>80%	Mix	200-700
	Commercial	10 kW - 2 MW	2-4 Hrs	>80%	Mix	200-400
	Industrial	500 kW - 5 MW	2-4 Hrs	>80%	Mix	200-400
Transmission or Distribution Deferral		1-20 MW	4-6 Hrs	>80%	Mix	20-100
Frequency support		1 MW- 20 MW	15 min – 1 Hr	<60%	Shallow	10,000-18,000
Reactive Power Management	Utility / C&I	3 KW - 10 MW	15 min – 1 Hr	N.A.	N.A.	N.A.

Performance Measures

Storage Technology	Roundtrip Efficiency (%)	Cycle Life
Lead Acid Batteries	60-70	300-500
Advanced Lead Acid	60-70	1000-2000
Lithium ion	85-95	2000-6000
Sodium sulfur	70-80	3000+
Sodium – Nickel chloride	80-90	3000+
Zinc Bromine Flow Battery	60-70	5000+
Vanadium Redox Flow Battery	60-75	5000+

Typical Price Trends



MHI Experience

Application example of MW class Containerized ESS_1



To factory for energy cost management

Use

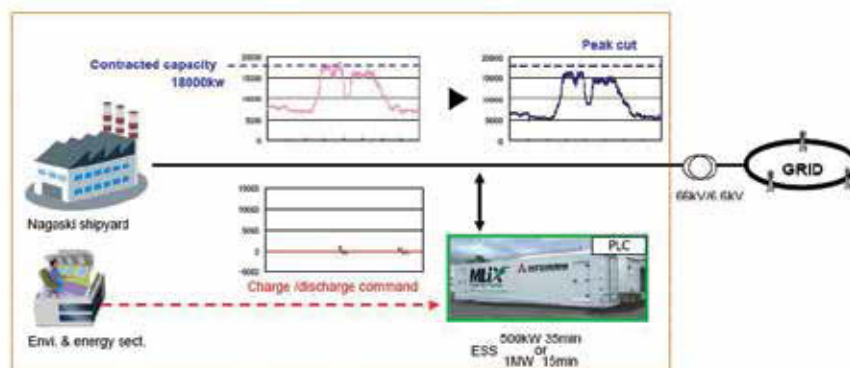
◎ Peak cut operation

ESS used to shift or reduce energy consumption at peak.

Discharge not to exceed contracted capacity at peak

Spec.

• ESS: 1 MW/ 250 kWh, Containerized ESS



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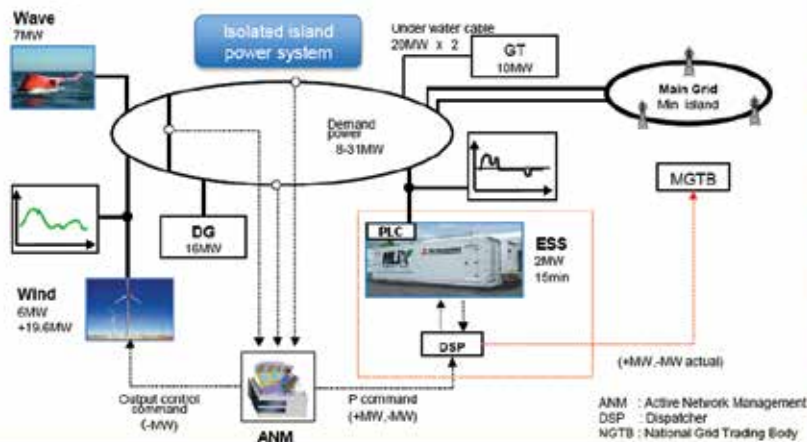
Application example of MW class Containerized ESS_2



To European transmission

Use ☉ Transmission congestion relief
To avoid congestion ESS stores extra energy at peak and releases the storage energy at off-peak.

Spec. ESS; 2 MW/ 500 kWh, Containerized ESS



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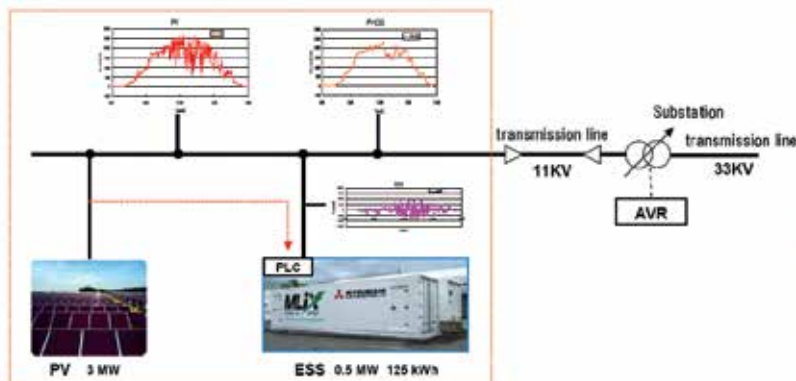
Application example of MW class Containerized ESS_3



To transmission in U.S.

Use ☉ Smoothing of PV power variation
Voltage controlled by OLTC (On-Load Tap Changer of TR). It operate frequently due to PV power variation. Smoothing control by ESS enable to reduce maintenance cost.

Spec. •500 kW/ 125 kWh, Containerized ESS



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Application example of MW class Containerized ESS_4



To Wind Farm in China

Use

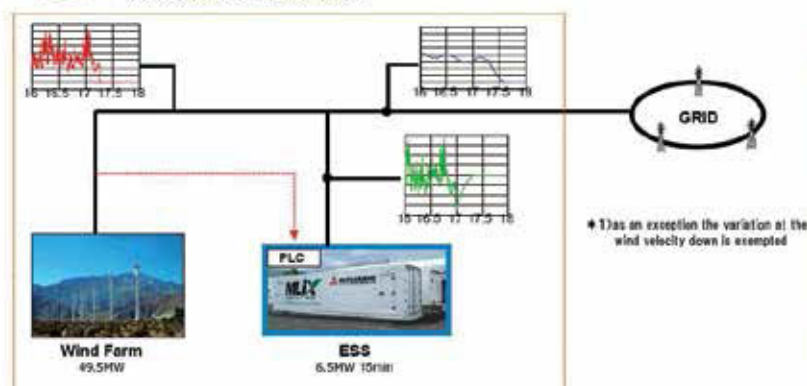
☉ Smoothing of wind power variation

ESS applied to comply with following China regulation

- Max variation in 1min. 10% of wind farm capacity
- Max variation in 10min. 33% of wind farm capacity

Spec.

- ESS: 6.5 MW/ 1.63 MWh
- Wind Farm: 49.5 MW



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Solutions using Energy Storage Systems (ESS)

Issue	Cost to TN	Solution using ESS	Comments
Reduction in UI Charges	Annual UI Charges ~	Typically shorter duration 15-30 min Li-lon batteries will be suitable for UI cost optimization. Longer duration Li-lon batteries can also allocate small portion for UI charge management,	Charge ESS through energy that gets curtailed during high wind season and discharge when frequency is low (UI charge is high). During low wind season charge ESS when grid frequency is low (UI charge is low).
Transmission Upgrade Deferral	Phase – III cost of INR 2,250 Crores (\$375M)	May require both shorter duration storage for dynamic stability and longer duration resources for congestion management.	Individual wind farms may also use this to pay less transmission charges
Dynamic Voltage Support	SVC + STATCOM, INR 423 Crores (\$70M)	Storage systems with inverters capable of four quadrant control may provide an alternative for voltage support as value added service	
Grid Regulating Service	Main cost is in backing down the baseload generation.	This service may best be suited for existing or new combined cycle gas turbines that can easily meet the ramp rates required for the grid regulating services. In case natural gas is unavailable grid scale storage can provide similar service.	States such as Tamil Nadu and Gujarat are experiencing major swings in wind output of magnitude of greater than 1 GW with in few hours, thus creating need for grid regulating services.

Renewable Energy News Digest

Brightening the future with the sun and wind

Renewables can play a greater role in a sustainable energy future, but proper accounting and specialised effort to understand their grid implications and scalability are necessary

POWER PROBLEM: “India’s energy grid is weak and unstable. This is why concerns remain about handling renewable energy.” Picture shows high voltage electricity towers on the outskirts of New Delhi.— PHOTO: AFP

The Renewable Energy (RE) Global Investor’s Meet inaugurated by Prime Minister Narendra Modi on February 15 invited participation in funding India’s RE growth ambitions, which include almost 1,00,000 MW of growth in solar power in just seven years (about 40 per cent of today’s total installed capacity) and some 50,000 MW of wind power. This is bold and ambitious to say the least. The event was a success, finding investment commitments for some 2, 60,000 MW of RE!

But a serious question facing Indians is whether at a time when most people are struggling to keep the lights on at home, because of the shortage of power, do citizens really care about carbon emissions and climate change, which have become the primary rationale for pushing green energy? Also if Indians are as notoriously price-sensitive as pundits claim, how much of a premium will they be willing to pay for RE?

Let’s not beat around the bush — RE, attractive as it might sound and improving in price performance every year, does require support. Support isn’t inappropriate, especially given the benefits of RE, but there are also externalities of another kind including implications for the rest of the grid. This needs deeper analysis.

Contextualising RE

In the West, utilities are already worrying about the Utility Death Spiral, where RE and storage and smart grids mean some consumers reduce, if not cut off, their utility purchases. This raises costs for the rest of the grid, which must still keep the system in balance and stable, and also serve the least profitable consumers. This prompts others to exit the system, and so on. While India isn’t quite there yet, we must first understand that an end consumer opting for RE and finding it worthwhile is based on his/her comparing retail tariff with generation costs, which aren’t comparable. First, distribution has its own costs, even after accounting for savings in distribution losses. Second, retail tariffs for so-called paying customers (especially commercial and industrial) are artificially high, since they cross-subsidise other users.

Renewables in India are different from renewables deployed in the U.S. and Europe, and understanding the differences is the key to viable policies. The triad of “usual” challenges of renewables remains in India, such as: intermittency/variability; location-specific potential (concentrated in areas sometimes away from consumers or the grid); and higher costs. However, there are

specific differences and needs that demand deeper analysis for the long-term viability of renewable energy.

In India, our peak demand is mostly in the evening, and the sun surely isn’t very bright at 7 p.m. Storage technologies are niche and expensive today, so solar power helps with energy (kilowatt-hour) needs, but not with our capacity needs. Wind is not much better, given its seasonality.

One of the typical calculations that power systems operators do is estimate how much RE the grid can handle. Typical figures from elsewhere are in the range of 20-30 per cent, with more requiring significant investments in transmission or peaker plants. India is different because its grid is very weak and unstable, and instead of having a reasonable reserve margin (which is typically 15-20 per cent in the West), there is a shortfall in the grid, officially in the range of 5 per cent or so, but actually much higher. The grid is kept afloat through massive “load-shedding” (feeder-level cut outs of supply).

There are other technical reasons why the Indian grid is weak, including lack of ancillary services (systems designed to keep the grid stable, instead of just pricing kilowatt-hours), and even a lack of time-of-day pricing for bulk procurement of power. There are few peaker plants (which would operate only some 5-10 per cent of hours in a year), since there isn’t sufficient incentive for these. Without incentives for plants that can ramp up quickly but may not get used much, how will the grid handle 20 per cent renewables?

Even worse, the types of plants capable of fast ramping are limited in near-term growth in India — hydropower (due to land and social/environmental challenges) and natural gas (due to supply constraints). Hydropower has an additional constraint when considering peaking or storage — its additional duty for water management (irrigation) limits when water can be stored versus released. Also, natural gas has overwhelmingly been built for baseload needs (with combined cycle plants), which cannot meet peaking requirements.

Making RE sustainable

Renewables can and should play a greater role in our sustainable energy future, but we need proper accounting and specialised effort to understand their grid implications and scalability. As part of a recent book on Making Renewable Power Sustainable in India, launched by Piyush Goyal, Minister for Power, Renewables, and Coal, we at Brookings India identified a number of policy imperatives for making RE sustainable. While the technical details need working out, especially in terms of regulations, support and incentive mechanisms, grid management, etc., we also identified a need to ramp up skills and innovation. All solar cells are imported today — this shouldn’t remain so. The first step towards making RE sustainable is a nuanced examination of the issues and trade-offs, and dialogue among all the stakeholders, especially state utilities, which ultimately deliver electricity to consumers.

Renewables have a bright future, and must play a leading role in India's power security and growth. They aren't a silver bullet, but a vital tool in the broader spectrum of India's energy future. Most importantly, renewables should not be viewed in isolation, as a drop-in supply-side solution, but rather as part of a transition if not transformation of the grid, which includes variable and dynamic pricing, distributed generation, storage technologies and smart grids. If RE is referred to as the energy source of the future, that future is well-nigh.

(Rahul Tongia is a Fellow at Brookings India, and Adjunct Professor at Carnegie Mellon University. He is also Advisor, Smart Grid Task Force, Government of India)

Renewables in India are different from renewables deployed in the U.S. and Europe, and understanding the differences is the key to viable policies

Source: The Hindu, Trivandrum

India's Nuclear (Li)ability

Much of January 2015 was spent in anticipation over President Obama's visit. The highlight of the trip was the announcement that issues with the Indo-US civil nuclear deal have been resolved. While the nuclear deal was initially signed in 2009 enabling for technology and equipment transfer from the US to India, there was no sign of any American companies showing interest in operating in India. This was mainly because of the 2010 Civil Nuclear Liability Act (that incidentally the BJP had insisted upon) which made the supplier jointly culpable for any mishap, instead of the earlier practice of making the operator and the country's government solely responsible.

The Act mandated that in the case of a mishap, it would be the Nuclear Power Corporation of India Ltd. (NPCIL)'s responsibility to pay the victims. The suppliers would be liable to reimburse NPCIL if the accident was proved to be their fault. The rules limit NPCIL's liability to Rs. 15 billion (\$ 240 million) for a 10 MW plant, beyond which, the Indian government would pay the damages. This meant that in the event of a major disaster, a large segment of the burden would be borne by the Indian taxpayers.

\$240 million is a paltry sum compared to the \$105 billion that Japan spent on dealing with the Fukushima disaster, and happens to be one of the lowest nuclear liability caps in the world. Yet, the American and Indian suppliers were not happy. This time around, the government found a way to further appease these suppliers. As per the latest talks, equipment suppliers will be able to purchase insurance, for liability up to Rs. 15 billion by paying a nominal premium, from a pool of Indian public sector insurance

companies. (Though the exact pricing hasn't been revealed yet, it is expected to be around Rs. 15 million annually.) This way, the suppliers are absolved of their responsibility of ensuring the highest standards of equipment safety.

This means that in the event of a Fukushima-type disaster in India, the supplier is liable to pay a maximum of \$240 million as compensation. But even this money will come from the public sector insurers and the rest of the bill will be footed by the government. In the end, the entire cost would be passed on to taxpayers in India.

Does that sound like something we want? Especially when in the aftermath of the Fukushima disaster, many of the world's developed economies who extensively use nuclear power have decided to phase it out. This includes Germany, France, Sweden, Switzerland and Japan. Even in the US, nuclear power is seeing fewer takers because natural gas is now a cheaper source of energy.

Country	Nuclear power Phase-out Plan
Germany	2022
Italy	All 4 nuclear plants were closed down after the Chernobyl disaster, with an indefinite moratorium on nuclear power plants
Switzerland	Slow phase-out by not extending running times or building new power plants
France	France derives 75% of its electricity from nuclear power plants, but has pledged to reduce dependence on nuclear power to 50% by 2025
Belgium	2025

When the world's most forward-thinking nations are moving away from nuclear power due to the high costs and safety risks associated with it, is it wise for India to reduce the liabilities on suppliers of nuclear reactors? For all those who are hailing this nuclear deal as the dawn of a new era for the Indian energy sector, it is perhaps time to take stock of what the worst case scenario could be. The Fukushima disaster is still fresh in memory and doesn't leave much to the imagination. In India, the victims of the 1984 Union Carbide gas tragedy in Bhopal have still not received their compensation and are still reeling from the impacts of that disaster. In case of a nuclear disaster, the impacts to life and the environment would be exponential. Maybe it is time for us to ask if we really need nuclear power that badly.

*Source: Upendra Bhatt & Indra Saha
Sustainability Outlook*

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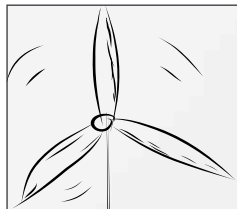
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*The prescribed AEP is site specific and depends on various climatic parameters

