



ASSESSING THE IMPACT OF KARNATAKA ELECTRICITY REGULATORY COMMISSION’S OPEN ACCESS ORDER FOR SOLAR POWER GENERATORS IN KARNATAKA

DEEPAK SRIRAM KRISHNAN AND ASHOK KUMAR THANIKONDA

EXECUTIVE SUMMARY

On 18 August 2014, the Karnataka Electricity Regulatory Commission (KERC) passed order number S/03/01 called ‘Wheeling Charges, Banking Charges & Cross Subsidy Surcharge for Solar Power Generators’, whereby all solar power generators in the state who achieved Commercial Operation Date (COD) before 31 March 2018 were exempted from payment of wheeling and banking charges and cross subsidy surcharge for a period of ten years from the date of commissioning.

This landmark order provided long term clarity for solar project developers and consumers. For certain categories of consumers (commercial), the exemption meant that solar energy became more viable while planning their energy mix.

From KERC’s perspective, the main drivers for passing this order was the low rate of growth of solar energy installations in Karnataka and the prevalent trend of a reducing solar tariff seen against rising utility tariffs. The Commission hoped that this measure would facilitate greater and rapid growth of solar energy through third party open access and captive routes.

Given the importance of this order, WRI is keen to track its on-ground impact to serve as a feedback mechanism to KERC and as a learning for other state regulators who may be looking for solutions to increase the quantum of solar energy in their states.

CONTENTS

Executive Summary.....	1
List of Acronyms.....	3
Karnataka Power Sector.....	3
KERC Order on Wheeling Charges, Banking Charges and Cross Subsidy Surcharge for Solar Power Generators	6
Initial Impact of the KERC Order on Solar Generation Projects.....	7
Next Steps.....	11
Annexure 1 - Questionnaire Used for Interviews	12
Notes.....	12
References.....	12

Disclaimer: Working Papers contain preliminary research, analysis, findings, and recommendations. They are circulated to stimulate timely discussion and critical feedback and to influence ongoing debate on emerging issues. Most working papers are eventually published in another form and their content may be revised.

Suggested Citation: Krishnan, Deepak Sriram; Ashok Kumar Thanikonda. 2015. “Assessing the Impact of Karnataka Electric Regulatory Commission’s Open Access Order for Solar Power Generators in Karnataka.” Mumbai: WRI India. <http://www.wri.org/publication/assessing-the-impact-of-kerc-order>.

Hence, this working paper examines the impact of this order one year after its enforcement. It also tries to highlight other factors that are hindering the large scale adoption of solar energy through the open access route.

The research activity for this working paper triangulated relevant data (capacity, time lines, and possible location of solar projects) from Karnataka Renewable Energy Development Limited (KREDL)-the state nodal agency for renewable energy; Bangalore Electricity Supply Company Limited (BESCOM)-the utility for Bangalore city and few surrounding areas; solar project developers and consumers who contract solar energy.

Evidence was gathered to understand the impact of the KERC order on the ground. The data put out by the KREDL regarding solar installations in the state as well as data issued by BESCOM concerning open access applications were studied. BESCOM's data-set was sifted through to extract the relevant data for open access applications by solar generators. A few solar plant developers and consumers (both from the industrial and commercial category) were interviewed to understand their perception regarding this order and plans to procure solar energy.

The main finding of this paper is that buyers and sellers of solar energy welcome the order. However, if one were to consider the time involved in understanding the possible implications of the order and other important factors associated with setting up a solar power plant such as land and power evacuation, the on-ground impact (measured in MWs commissioned or MUs wheeled) will only be seen from the fourth quarter of Financial Year (FY) 2016 onwards.

Hence, this working paper should be seen as the first step

in tracking the on-ground impact of the new solar policy, and to start collecting the data and help develop insights that BESCOM, KERC, KREDL and other stakeholders (including regulators from other states) can use to improve their decisions over time.

Some of the possible outcomes of this paper are as follows.

- KERC understands the impact of its regulation and uses this analysis while framing future decisions.
- BESCOM and KREDL track upcoming and commissioned solar projects (through the open access route) accurately to help in their planning process as well as informed policy making.
- Green Power Market Development Group (GPMDG) member companies such as Infosys, Bangalore International Airport Limited, Coca Cola, Cognizant and other companies use this analysis in their internal and external conversations (with state planners / administration) and are influenced to set up/contract solar energy under the third party open access route.
- Other state utilities/regulators use this as a guideline while framing regulations to encourage the growth of solar energy in their respective states.
- National policy makers gain insights on the design of effective national policy that achieves the 100 GW solar target by 2022.

The paper concludes with a call for establishing an open database which can help track solar capacity set up for consumption through the open access route. We hope that this will facilitate a transparent and data-driven policy formulating mechanism.

LIST OF ACRONYMS

BESCOM	Bangalore Electricity Supply Company Limited
CEA	Central Electricity Authority
CESC	Chamundes hwari Electricity Supply Corporation
ESCOM	Electricity Supply Corporation
FIT	Feed in Tariff
GESCOM	Gulbarga Electricity Supply Company Limited
GPMDG	Green Power Market Development Group
HESCOM	Hubli Electricity Supply Company Limited
KERC	Karnataka Electricity Regulatory Commission
KPCL	Karnataka Power Corporation Limited
KPTCL	Karnataka Power Transmission Corporation Limited
KREDL	Karnataka Renewable Energy Development Limited
kWh	Kilo Watt-hour
LGBR	Load Generation Balance Report
MAT	Minimum Alternate Tax
MESCOM	Mangalore Electricity Supply Company Limited
MU	Million Units (kWh) of electricity
PCKL	Power Company of Karnataka Limited
PV	Photovoltaic
RE	Renewable Energy
RPO	Renewable Purchase Obligation
SLDC	State Load Dispatch Center

KARNATAKA POWER SECTOR

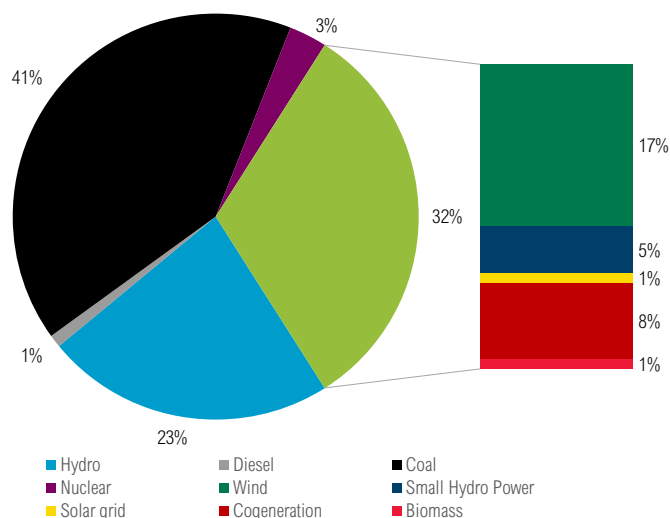
Introduction

Karnataka is a state located in the southern peninsula of India. It is a pioneer in the Indian power sector – Asia's first hydroelectric station was established at Shivanasamudram (Khajane 2008) in 1902. It was also one of the states which initiated the power sector reforms process before it was codified and implemented at the pan-India level (C-STEP 2013).

As on 31 October 2015, the installed capacity in the state (CEA 2015) was 15,647 MW (5.7% of India's total installed capacity) of which 4928 MW (KREDL 2015) was contributed by renewable sources of energy (13.51% of India's total RE capacity). A breakup of the capacity is

provided in the figure below.

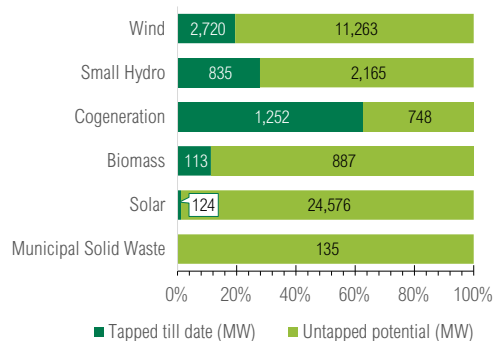
Figure 1: | **INSTALLED CAPACITY IN KARNATAKA**



According to the Central Electricity Authority(CEA)'s Load Generation Balance Report (LGBR) for 2015-16, the state faced an energy deficit of 4.3% (2,717 MU), falling in the bottom 29th percentile, and a peak demand deficit of 4.5% (452 MW) falling in the bottom 35th percentile in the financial year 2014-15. For 2015-16, the CEA anticipates a shortfall of 16% (11,229 MU) in energy terms and a shortfall of 25.6% (2792 MW) in peak demand terms (CEA 2015). This statistic highlights the need for a concerted effort in addressing the likely demand-supply gap that the state is likely to face.

One possible way of bridging this deficit is by tapping the rich renewable energy potential of the state. Figure 2: RE Potential vs Capacity Tapped in Karnataka highlights how only a small fraction of the vast potential (KREDL 2015) (CII, Deloitte 2015) has been tapped.

Figure 2: | **RE POTENTIAL VS CAPACITY TAPPED IN KARNATAKA**



¹As on October 2015, only 124 MW of solar power out of a total potential of 24,700 MW has been tapped. There are many reasons for this namely the historically prevalent high prices²; grid usage charges that contribute to a higher landed cost at the customer's premises; and Karnataka's land conversion policy that introduced a long lead time for projects.

If these issues are resolved, and the capacity is fully exploited, Karnataka could meet nearly one fourth of India's 100,000 MW solar target (Kapoor 2015) which is to be achieved by 2022.

Institutional Structure

The overall responsibility for the power sector in Karnataka lies with the Department of Energy, Government of Karnataka. Figure 3: Organizations in Karnataka Power Sector represents the organizations involved in functions from electricity generation to transmission, distribution and utilization in the state.

In addition to the organizations listed in Figure 3: Organizations in Karnataka Power Sector, there is Power Company of Karnataka Limited (PCKL), a special purpose

vehicle to supplement the efforts of KPCL in adding capacity to the state. PCKL does this mainly through long term contracts under various models. However it has also taken up short term power procurement activities in order to bridge the short term demand supply gap.

The autonomous KERC serves as the sector regulator with chief functions including that of regulating all aspects of the electricity sector in the state in an objective, professional and transparent manner; safeguarding consumers' interests and ensuring reliable, low cost power supply as a basic input for the economic and social development of the state.

State Policies Pertaining to Renewable Energy

Developments in renewable energy have been broadly guided by policies issued by the Government of Karnataka and the resultant regulations issued by KERC. It is normal practice for these developments to evolve with time and be influenced by technological changes, hurdles faced by different stakeholders, and the achievements of targets. This section provides a snapshot of the regulatory and policy evolution in the state with respect to renewable energy in general, and solar energy in particular.

FIGURE 3 | ORGANISATIONS IN KARNATAKA POWER SECTOR

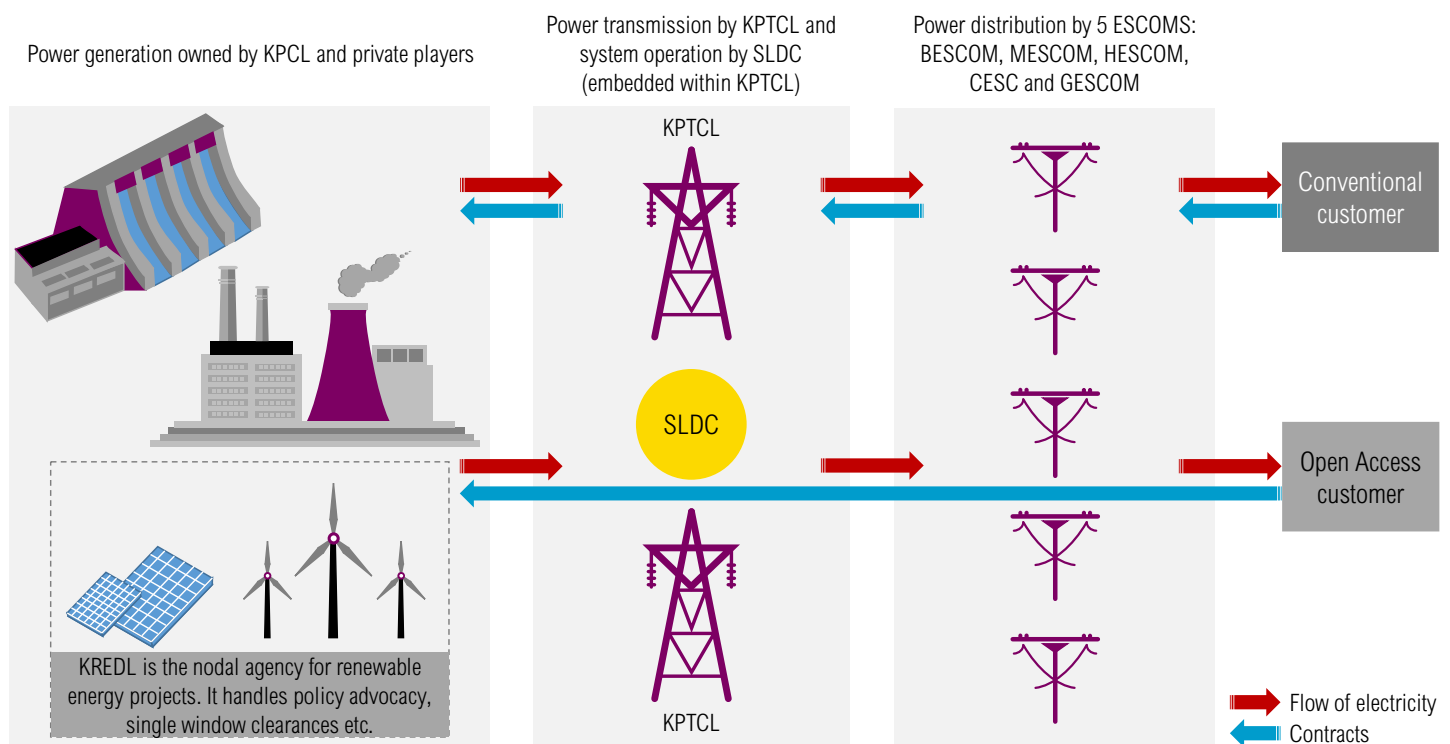


Figure 4: | **SUMMARY OF RE POLICIES IN KARNATAKA****KARNATAKA RENEWABLE ENERGY POLICY 2009-2014**

- First major policy issued by Government of Karnataka
- Targetted achieving 4326 MW of RE by 2014.
- Conferred industry status on RE development helped in ease of land procurement
- Extending incentives like FIT benefits, fulfilment of Renewable Purchase Obligations, banking facility for the projects, exemption from demand cut up to 50% of installed capacity for captive use

KARNATAKA RENEWABLE ENERGY POLICY 2014-2020 (DRAFT)

- Achievement under the previous policy regime was only 2104 MW against a target of 4326 MW
- The government recognized that there is significant scope for the state to achieve more by way of RE capacity addition considering the potential still to be tapped
- Envisages a minimum addition of 3600 MW by 2020

KARNATAKA SOLAR POLICY 2011-16

- The policy envisaged a target of 200 MW up to 2015-16 solely through contracts with the utilities. The project selection was to be achieved through a competitive process with a tariff ceiling set in accordance with the KERC tariff Dated 13th July 2010

KARNATAKA SOLAR POLICY 2014-2021

- Technological progress necessitated a relook at the capacity addition plans. Hence, the state government felt that it was necessary to aim aggressively for higher targets so that 3% of the total energy consumption of the state in 2021 came from solar energy
- One of the key features of this policy is the inclusion of third party and captive transactions under its ambit. The policy also opens up the possibility of initiatives like solar parks, grid tied canal corridor projects and grid connected solar with other renewable hybrid projects. This could benefit from a simple explanation.

Regulations and Orders Facilitating Renewables

In addition to the policies issued by the state government, the regulator (KERC) has also issued regulations and orders that have helped in the growth of renewable energy in the state.

Obligations upon distribution licensees

The KERC issued the KERC (Power Procurement from Renewable Sources by Distribution Licensee) Regulations, 2004 (KERC 2004) by which distribution licensees were mandated to procure a minimum 5% and a maximum 10% of electricity from renewable energy sources expressed as a percentage of its total consumption in a year. This was amended in 2011, 2012 and 2015 (draft), and currently, different levels of solar and non-solar obligations are proposed for the period from FY 2015-16 to FY 2019-20

for each distribution company in Karnataka (KERC 2015).

Ease of grid usage

In line with the specifications of the Electricity Act 2003, KERC issued the Karnataka Electricity Regulatory Commission (Terms and Conditions for Open Access) Regulations, 2004 (KERC 2004). This allows open access users to use the intra-state transmission and /or distribution systems of licensee(s) in the state for wheeling the power contracted from an independent generator³. Thus, consumers (who meet certain criteria) can look for alternate sources of power (including renewable energy generators) and not be dependent solely on the distribution licensee for its electricity requirements. Renewable energy providers (like other generators) seeking open access are expected to pay the following charges:

- Transmission charges if the transmission network is used
- Wheeling charges for use of the distribution system
- Cross subsidy surcharge
- Additional surcharges payable to the distribution licensee as may be allowed by the regulatory commission
- Charges for arranging backup supply from the grid
- Charges for deviation from the agreed schedule of consumption
- Scheduling and system operation charges
- Reactive power charges

This regulation has been amended in 2006 and 2014.

Fiscal and tax incentives

The Government of Karnataka's extant solar policy offers fiscal incentives by way of tax concessions in line with the Karnataka Industrial Policy under the following heads: entry tax, stamp duty and registration charges. In addition, industrial consumers who contracted solar energy through third party/captive transactions were allowed, subject to the regulator's approval, corresponding pro-rata reduction in contract demand.

This is over and above the tax incentives offered by the Central government (PwC 2015) which is as follows:

- An income tax holiday for 10 consecutive years for the project (however, a Minimum Alternate Tax (MAT) of 20% would apply)
- Accelerated depreciation of 80% on solar and wind

- assets
- Deemed export benefits for manufacturers that support the Renewable Energy (RE) sector
- Duty concessions and exceptions to the RE sector

Specific Orders for Solar Energy

In addition to the regulatory framework aimed at facilitating the growth of renewables, there are a few orders that the KERC has issued specifically for grid connected solar power plants covering the following subjects:

- Tariff for grid interactive megawatt scale solar power plants selling their output to the utility (KERC 2015)
- Standard formats for power purchase agreements (KERC n.d.)
- Introduction of banking facility (KERC 2013)
- Determination of wheeling charges, banking charges and cross subsidy surcharge (KERC 2014)

This working paper proposes to discuss the order ‘Determination of wheeling charges, banking charges and cross subsidy surcharge’ and assess the impact that it has had on planning, execution and commissioning of grid connected solar power projects.

KERC ORDER ON WHEELING CHARGES, BANKING CHARGES AND CROSS SUBSIDY SURCHARGE FOR SOLAR POWER GENERATORS

As part of the annual tariff setting process in Karnataka, the wheeling, banking and cross subsidy surcharges of the utility are reviewed and sometimes revised. While the wheeling and banking charges remained the same over the last few years, the cross subsidy surcharge showed significant variation.

Our interactions revealed that even though solar energy generators were exempted from these charges, the fact that the topic was discussed every year led to uncertainty, and was one of the factors that affected the pace of investments in the solar sector in the state.

In an order issued on 10 October 2013 concerning “*Determination of Tariff for grid interactive solar power plants including rooftop and small solar photovoltaic power plants*”, the KERC had decided not to levy any wheeling and banking charges, or cross-subsidy surcharge

on solar generators who sell electricity through the open access route within the state.

This decision was taken to enable, to the extent possible, solar power producers to be competitive in the market. The tariff applicable at that time (2013) for solar PV power plants (KERC 2013) was ₹ 8.40/kWh while the industrial and commercial tariffs respectively were ₹ 5.65/kWh and ₹ 7.25/kWh (in the BESCO license area (KERC 2014)) and ₹ 5.65/kWh and ₹ 7.05/kWh (in the license area of other ESCOMS) (KERC 2014). Subsequently, the Commission clarified that this exemption was available to solar power plants that were commissioned before 31 March 2018.

Following this order, the KERC received representations from stakeholders including corporate members of the Green Power Market Development Group (details in Box 1.0), requesting for exemption from wheeling, banking and cross-subsidy surcharge for at least the period of debt repayment, which typically ranged from 10-15 years. The argument put forth by the stakeholders was that the solar auctions conducted by the central and state governments had clarity on all applicable charges for a period of 25 years. This made the cash flows transparent and hence the projects were more amenable to be funded. In the case of Karnataka, an absence of such long-term clarity was preventing financial institutes from funding solar power projects which were selling power through captive and third party open access routes.

The Commission recognized two clear trends that were moving in opposite directions— retail supply tariff was increasing year on year, and solar power tariff was following a decreasing trend mainly due to gains in the technological and business sphere (i.e. scale of manufacturing and fiscal innovation). The Commission therefore envisaged a key role for solar Photo-Voltaic (PV) in the state’s electricity mix.

Juxtaposed against this were the limited solar capacity additions in the state and the ensuing need to encourage solar power generation. It was the Commission’s view that solar energy generation had to be promoted through both the available channels – sale to the ESCOM and direct sale through open access to the end consumers.

The existing tariff setting mechanism provided visibility for the sale of solar energy to ESCOMS for a period of 25 years. On the same lines, the Commission was of the view that for third party open access transactions, concessional charges may need to exist for a greater duration so as

to enable investors to secure funding from financial institutions.

In light of the above background, the Commission issued a discussion paper on 7 July 2014 to elicit views from the sector stakeholders on the duration of the proposed exemption from grid usage charges for solar power plants, and whether nominal grid usage charges should be levied instead of a complete exemption.

A public hearing to seek the views of the concerned stakeholders was conducted on 31 July 2014. The Commission subsequently opined that:

- The state was a long way from fulfilling its solar energy generation potential. At the time of delivering the order, the ESCOMs in the state were not able to even source 0.25% of their total energy purchase through solar (this was the prevailing RPO level at that time in Karnataka). The Commission stated that only 41 MW of solar was operational at that time with 250 MW more in the pipeline, most of which was being sold to the ESCOMs. The Commission observed that solar power generation use by captive and third parties through the open access route had not come up on a large scale and hence there was a need to promote solar power use by such entities within Karnataka to help the overall solar sector in the state.
- There was an established precedence in this matter. For other renewable sources of energy, the Commission had, on 4 July 2014 issued orders extending the concessional wheeling and banking benefits for a period of 10 years effective from the date of commercial operation, provided that the date was before 31 March 2018.
- A reduction in capital costs which would make solar competitive even with the other renewable sources of energy was possible in the next 3-4 years. Hence this exemption would be useful for projects to be competitive during this phase.

Considering the above factors, the Commission, on 18 August 2014 passed the order number S/03/01 called “*Wheeling Charges, Banking Charges & Cross Subsidy Surcharge for Solar Power Generators*”, whereby – *All solar power generators in the State achieving commercial operation date (CoD) between 1 April 2013 and 31 March 2018 and selling power to consumers within the State on open access or wheeling shall be exempted from payment of wheeling and banking charges and cross subsidy surcharge for a period of ten years from the date of commissioning. This is also*

applicable for captive solar power plants for self-consumption within the State.

Captive solar power plants opting for Renewable Energy Certificates shall pay the normal wheeling, banking and other charges as specified in the Commission's Order dated 9 October 2013.

INITIAL IMPACT OF THE KERC ORDER ON SOLAR GENERATION PROJECTS

From the discussions in the preceding sections, it is clear that the Commission's intent behind the order was to catalyse the development of the solar PV sector in Karnataka by encouraging third party open access and captive power transactions, in addition to the traditional route of energy sales to the ESCOMs.

Further, since October 2013 when the issue was initially discussed, grid connected solar PV tariffs have fallen to the range of ₹ 6-6.50/kWh⁴. At the same time the retail tariffs for industrial and commercial consumers have risen to ₹ 6.3/kWh and ₹ 7.85/kWh respectively in the BESCO license area (from the earlier ₹ 5.65/kWh and ₹ 7.25/kWh¹ (KERC 2015); and ₹ 6.15/kWh and ₹ 7.65/kWh respectively in the non-BESCO licensee areas (from the earlier ₹ 5.65/kWh and ₹ 7.05/kWh¹ (KERC 2015).

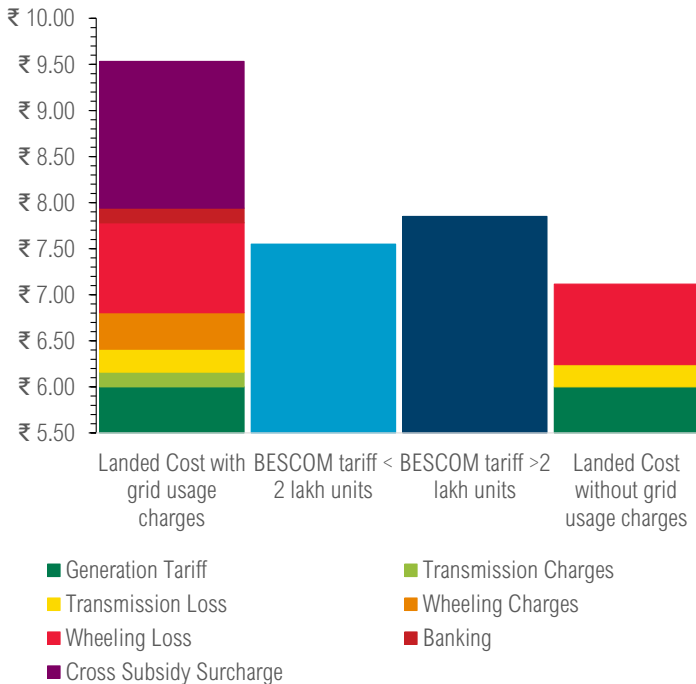
From this, it seems that the economic case for adopting solar energy into a company's energy mix is becoming more evident. Solar PV tariff is on a downward trajectory while the retail tariffs in some circumstances even exceed the solar PV rates. WRI is of the opinion that this factor, coupled with the exception granted by the KERC order and the growing awareness of the benefits of environmentally friendly power production should result in a significant uptake in the number of solar projects – in the planning stage at the very least if not at the stage of commissioning or commercial operation.

Consider the case of a Commercial category consumer of BESCO who is located in the municipal limits of Bangalore. Such a consumer will be labelled as a High Tension (HT) 2b (i) consumer in the tariff schedule. Such a consumer pays BESCO a tariff of ₹ 7.55/kWh for consumption between 0 to 200,000 kWh and from the 200,001st kWh, pays ₹ 7.85/kWh (KERC 2015).

Assume a solar generator which is able to generate solar energy at ₹ 6/kWh at its generation bus-bar. Consider

a transmission system charge of ₹ 0.16/kWh and a loss of 3.88% in the system (KERC 2015). At the BESCOM network level, the corresponding wheeling charges and loss are ₹ 0.40/kWh and 12.28% respectively. Also consider wheeling and banking charges of 5% of energy input and 2% of energy input respectively for the distribution system (KERC 2015).

Figure 5: | LANDED COSTS PER KWH



The first bar illustrates the case where the grid usage charges have not been waived off by the KERC. In this case, it can be clearly seen that the landed costs at the customer premises are not competitive with the rates offered by BESCOM.

Consider a case where the grid usage charges are waived. The effect can instantly be seen – solar energy is extremely competitive and can provide sustained savings for this category of customer.

What This Study Aims to Achieve

At the time of issuing the order, only 41 MW of solar projects were commissioned in the state. Since then, the installed capacity of solar projects has grown to 124 MW. (KREDL 2015)

This study assesses the influence that the order has had on the number of projects being commissioned/approved/

planned/conceptualized in the state through the third party open access route. The study also tried to capture the factors that are still hindering the large scale corporate adoption of solar energy.

This research also aims to identify questions to be deliberated upon and probably answered at a later date. For example, during the public hearing held before the order was issued, BESCOM had suggested that cross subsidy surcharge be reintroduced at a later stage once the solar installations have reached a certain capacity. Understanding what this capacity is and what are the triggers which can initiate a review would be useful questions to deliberate upon to ensure that there is consistency and adaptability in policy formulation.

This research can inform regulators, utilities, and companies either interested in selling solar energy to the grid or buying solar energy through the open access route. For example:

- KERC understands the impact of its regulation and uses this analysis while framing future decisions.
- BESCOM and KREDL track upcoming and commissioned solar projects (through the open access route) accurately to help in informed policy making.
- GPMDG members and other companies use this analysis in their internal and external conversations with state planners / administrators and are influenced to set up/contract solar energy under the third party open access route.
- Other state utilities/regulators use this as a guideline while framing regulations to encourage the growth of solar energy in their respective states.
- National policy makers gain insights on designing effective national policy that achieves the 100 GW solar target by 2022.

Methodology

This research triangulated relevant data from KREDL the state nodal agency for renewable energy, BESCOM the utility for Bangalore city and few surrounding areas, solar project developers and consumers who contract solar energy. To help answer questions, we conducted structured interviews with the following set of stakeholders.

- KREDL
- Corporate members of GPMDG who were likely to buy

- solar power
- Solar power plant developers
- BESCO

Secondary research consisted of collating relevant statistics from the BESCO and KREDL websites. The questionnaires used during the interactions with the different stakeholders are included in Annexure 1 – Questionnaire Used for Interviews.

Research Findings

Primary research

As part of this research, we met with/spoke to two developers and three consumers. Two more developers didn't want to comment; one developer and two consumers did not respond to our request for comments. Nearly all stakeholders requested anonymity and their request has been honoured.

Table 1: | **SUMMARY OF RESPONSES FROM STAKEHOLDERS**

STAKEHOLDER NAME (MADE ANONYMOUS UPON REQUEST IN SOME CASES)	PERCEPTION REGARDING THE ORDER	OBSERVED IMPACT	CONSUMER CATEGORY	INDICATIVE CAPACITY (MW) OR ENERGY (MUS)	LIKELY DATE OF SUPPLY COMMENCEMENT
BIAL	Makes it more viable to enter into PPA for solar energy.	Already receive very highly reliable power from BESCO Going in for third party transactions must make sense both from reliability and the cost perspective Wind is not economical without requisite shareholding as per group captive norms. For a pure Open Access transaction, solar is preferred – the order makes it easier to convince the management; process initiated for procurement of solar energy	HT-Commercial (non BBMP areas)	20 Mus (corresponding to approximately 11.5 MW @ 20% PLF)	6 months from date of PPA signing – approximately 2016
Leading beverage manufacturing corporation	Order is more useful for solar developers and commercial customers.	Have been approached by two developers. However, as an industrial user, wind is the preferred option due to better economics.	HT – industrial	No	-
Technology Major	A very positive order which provides long term visibility.	Process initiated for procurement of solar energy through open access.	1 facility HT-Commercial and 1 facility HT industrial	Approximately 10 MWhr	Q3 to Q4 of FY 2016
Former officer in a prominent developer	Mixed views – policy certainly could have been extended for 20-25 years. Will not make sense for industrial consumers.	Observed more enquiries; but not seen further activity on the ground. Capacity addition hampered by difficulties in land acquisition.	NA	-	-
Developer backed by a prominent PE fund	The order is revolutionary; it effectively equates the seller's revenue and the buyer's cost. There is bound to be a lead time in which the ecosystem adapts. Hence, the impact on the ground is likely to be seen only in the next financial year (FY 16). Infrastructural challenges can affect progress—land acquisition especially is a major challenge. Consumers are also only now opening up to longer term PPAs.	Executed 2 PPAs and expected to commence supply in March 2016.	NA	15 MW by March 2016 (out of a total capacity of 35 MW). Additional 50-70 MW in the pipeline.	NA

The summary of the interviews is given below.

- Perception – All the respondents felt that the order was a landmark one and was positive for the sector. It makes it more viable for companies to enter into a bilateral power purchase agreement (PPA) without the need to take an equity stake in the generating plant (a key criteria for captive power plants). This is a roundabout alternative and hence this order saves a lot of time and effort for all stakeholders.
- Usefulness—Users who fall under the industrial tariff category do not see much rationale to go in for solar as the price differential is not very attractive. Hence the uptake in this category will be limited. However, commercial tariff users will definitely benefit because of the favourable price differential.
- Action on ground – As on October 2015, only 3 MW of solar energy is being consumed through the open access route. Interviews indicate that approximately 100 MW could come online by the end of FY 16 (31 March 2016); procurement/ project development for the concerned projects is underway.
- Challenges to achieving rapid scale-up of solar installation – Respondents identified two major challenges (a) ease of availability of land for setting up projects (b) consumer ambivalence to long term Power Purchase Agreements (PPAs) due to intra-organizational constraints.

The detailed responses are tabulated in Table 1.

Secondary research

Based on the analysis of data available on the KREDL website, the following categories of solar projects that have been commissioned up to 31 March 2015 is drawn up:

Table 2: **SOLAR PROJECT CATEGORIZATION AS PER KREDL**

CATEGORY OF PROJECT	DEVELOPER	OFF-TAKER	CAPACITY (MW)
Government projects	KPCL	State ESCOMs	14
RPO projects	Private Developers	State ESCOMs	69
RPO projects	Private Developer	Private party through captive/open access route	1

In addition, an in-person meeting with KREDL indicated that a further 17 MW has been commissioned since 31 March 2015. The statistics indicate the agencies under whose aegis the projects have been commissioned but do not indicate the off-taker details.

Going by the available numbers, solar transactions account for 1% of all open access/captive transactions within Karnataka.

In addition, an analysis of the open access data put out by BESCOM shows that predominantly wind Independent Power Producers (IPPs) are wheeling power to open access consumers.

WRI interacted with the Managing Director, BESCOM and the power purchase section of BESCOM to understand the current scenario with open access applications and if there have been any open access application submitted by solar energy generators.

In response, BESCOM provided us with the following statistics dated 31 July 2015.

Table 3: **OPEN ACCESS STATISTICS, BESCOM, JULY 2015**

CATEGORY	STATUS AS ON JUNE 30 2015	JULY 2015 STATUS	CUMULATIVE STATUS	CAPACITY (MW)
Open access applications received	53	7	60	310.35
Open access cases approved	48	7	55	280.55
Open access cases implemented	28	6	34	176.15
Open access cases rejected	5	0	5	29.8
Open access cases pending	0	0	0	0

Out of these applications, the only solar generator applicant who has opted for open access is Atria Power Corporation who has established a 3 MW solar thermal plant in Ranebennur Taluk, Haveri District of Karnataka (the license area of HESCOM). This power is wheeled to

Atria Hotel which is present in the BESCO license area. According to BESCO, the open access application was made in December 2014.

In summary, while the KERC order has provided a nudge towards solar projects coming up during the course of this financial year, there are other issues especially those concerning conversion of land from agricultural to non-agricultural use (where applicable) that the state has to resolve if it wants to quickly tap its vast solar potential. Also, a current quantum of 3 MW through open access implies that the utility will not be too worried about losing its high paying customers. However, if the expected capacity of 100 MW does come up by 31 March 2016, with the potential of more capacity being added, utilities could see more material impacts to their revenues.

NEXT STEPS

This working paper has traced the circumstances that led to the KERC order number S/O3/01 called “*Wheeling Charges, Banking Charges & Cross Subsidy Surcharge for Solar Power Generators*” dated 18 August 2014 being passed, and has attempted to capture the on-ground impact of the said order through secondary research and interviews with key stakeholders.

One important point that has emerged is the need for a consistent database across government agencies. For example, KREDL's website indicates that 1 MW of solar power is categorized under the open access route. Data on solar open access made available by BESCO, however, indicates that 3 MW of solar thermal power is being wheeled across the licensees' networks. This 3 MW solar thermal project of Atria Power however, is categorized in the KREDL website as an RPO project allotted to GESCOM. Policy formulation depends heavily on the accuracy of data, and the key institutions of the state should evolve a mechanism of data validation and cross-verification to ensure the same.

Through our research we have understood that there are

organizations in Karnataka who clearly spot merits in the order and have begun the process of contracting solar PV energy. Still, these are early days as far as substantive impact on the ground is concerned. The interviews conducted seem to indicate that it is only in the fourth quarter of FY 16 and beyond, that the true impact of this policy can be assessed.

In addition, waiver of grid usage charges alone is not a panacea for solar PV growth. There are other issues such as land acquisition and evacuation capacity that can stymie the growth of the sector. Hopefully, clarity on grid usage charges can spur stakeholders to look for similar decisive solutions to the other issues.

There are many angles to this research and we plan to build on this base to set up an open database to monitor the growth of the solar sector in the state. We would like to work closely with the government agencies to ensure that properly categorized data (with adequate privacy protection) is made available to stakeholders to stimulate action toward achieving Karnataka's solar potential.

Through this, we also aim to study the impact of open access for solar energy on the ecosystem, which will cover the financial impact on BESCO's other grid users. It may be recalled that BESCO had recommended that cross subsidy surcharge be reintroduced at a later stage once the solar installations have reached a certain capacity. Monitoring the growth of third party solar PV transactions will help determine the triggers for the next policy review by KERC. The outcome of this study will be useful for other states in India with solar energy potential. Time-bound policies such as this, coupled with a robust and transparent tracking mechanism could help encourage the growth of the sector. In addition, a transparent updated data-set can help evolve policy with the requirements of a particular point of time in the future. Our research will help establish the vital role that the private sector has to play in achieving the national government's solar targets. This will also spur innovative models for utilities and private sector companies to collaborate in a win-win manner to scale up solar energy penetration.

ANNEXURE 1 – QUESTIONNAIRE USED FOR INTERVIEWS

Questions posed to BESCOM

- 1 What are your general impressions about the order?
- 2 How many applications for open access have been received from solar developers and consumers following the order?
 - a Data on number of applications; capacity; approved; time line for transactions to commence
- 3 What category of consumers have been applying?
- 4 During the hearing while finalizing the order, BESCOM had recommended that the CSS be levied at a later date when the solar power generation increases.
 - a Is there a preset solar power generation (OA and Captive) threshold that BESCOM is going to monitor?
 - b How will BESCOM look to offset potential revenue losses until the level is reached? What are the areas where it sees possible savings?

Questions for consumers

- 1 What are your general impressions about the order?
- 2 Have you considered / planned for/ negotiated / contracted for solar energy?
- 3 If yes, please share the quantum with us (MW/ Mwh).
- 4 If yes, please also indicate whether your decision was a direct result of the order.
- 5 If you have not planned to procure solar, is it
 - a A general decision not linked to this order? If yes, please indicate your reasons OR
 - b Are there factors other than the ones mitigated through this order that you think are crucial? Please name the factors in order of priority (your point of view).
- 6 If you have gone ahead and made the procurement, could you please share with us:
 - a the expected savings over say 10 years?
 - b By when do you expect the electrons to flow?
 - c Tenure of the agreement

Questions for KREDL

- 1 What are general impressions about the order?

- 2 How many applications to set up solar plants have been received from solar developers following the order?
 - a Data on number of applications; capacity; approved; time line for transactions to commence
- 3 Please share with us the locations of these plants.
- 4 How many developers have reached out to you for initial discussions? (not reached the stage of submitting the application)

Questions for developers

- 1 What are your general impressions about the order?
- 2 How many enquiries have you received from customers following the order?
 - a Quantum? Time line?
- 3 How many of these enquiries have converted into committed orders?
- 4 What is the time line for setting up these plants?
- 5 How many of the enquiries in your view are a direct result of the KERC order?
- 6 What are the other factors that customers use to evaluate their decision?

NOTES

1. The wind potential for Karnataka shown in the graph in Figure 2 corresponds to the resource assessment undertaken with a hub height of 80 m. However, recent studies conducted by the National Institute of Wind Energy (NIWE) indicates that this could possibly go up to 55,857 MW (http://niwe.res.in/departement_wra_100m%20agl.php). However, as KREDL has not yet officially adopted the new figures, this publication refers to the old potential numbers.
2. This factor has seen a tremendous improvement with a dramatic decline in prices over the last 3-4 years.
3. Independent generators or Independent Power Producers (IPPs) are generators that are typically owned by private sector entities and are typically free to sell their power to utilities or other private parties.
4. Based on recent tariff numbers that WRI has evaluated. We have also considered the recent aggressive bids ranging from ₹4.63-5.15/kWh in Andhra Pradesh and Madhya Pradesh respectively. However, these are utility scale large capacity projects. It is more realistic in third party contracts where capacity will be sold incrementally for tariffs to be closer to ₹6 per kWh.

REFERENCES

1. CEA. 2015. "All India Installed Capacity (in MW) of Power Stations." CEA. October. Accessed November 2015. http://www.cea.nic.in/reports/monthly/installedcapacity/2015/installed_capacity-10.pdf.
2. CEA. 2015. Load Generation Balance Report 2015-16. New Delhi: Central Electricity Authority, Ministry of Power, Government of India.
3. CII, Deloitte. 2015. Solar Power in Karnataka - Charting the path for a bright future. Knowledge Paper, Bangalore: Deloitte.

4. C-STEP. 2013. "Karnataka's Power Sector Roadmap for 2021-22." C-STEP. July. Accessed November 2015. http://shani.cstep.in/sites/default/files/CSTEP_Karnataka%20Power%20Sector%20Roadmap%202021-22_Wind%20Power.pdf.
5. Kapoor, Tarun. 2015. "100000MW-Grid-Connected-Solar-Power-Projects-by-2021-22." MNRE. 1 July. Accessed September 20, 2015. <http://mnre.gov.in/file-manager/grid-solar/100000MW-Grid-Connected-Solar-Power-Projects-by-2021-22.pdf>.
6. KERC. 2015. "Determination of tariff for Grid Interactive Megawatt scale Solar Power Plants." KERC. 30 July. Accessed November 23, 2015. http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2015/Determination_of_tariff_for_Grid_Interactive_Megawatt_scale_Solar_Power_Plants.pdf.
7. KERC. 2013. "Determination of Tariff for grid interactive solar power plants including rooftop and small solar Photo voltaic power plants." KERC. 10 October. Accessed November 23, 2015. http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2013/Final_Order-09.10.2013.pdf.
8. KERC. 2015. "Draft KERC (Procurement of Energy from Renewable Sources) (Third Amendment) Regulations, 2015." KERC. 02 July. Accessed November 23, 2015. http://www.karnataka.gov.in/kerc/Regulations/Regulations/KERC%28Procurement_of_Energy_from_Renewable_Sources%29%283rd_Amendment%29Regulations_2015.pdf.
9. KERC. n.d. "Draft PPA Solar Power Projects." KERC. Accessed November 23, 2015. http://www.karnataka.gov.in/kerc/Documents/Draft_PPA_Solar_Power_Projects.pdf.
10. KERC. 2015. "etail Supply Tariff approved by K.E.R.C. in Tariff Order 2015-16 for BESCOM." KERC. 02 March. Accessed November 23, 2015. http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2015/TARIFF%202015-16/Retail_Supply_Tariff_2015-16_BESCOM-English-02.03.2015.pdf.
11. KERC. 2013. "In the Matter of Introduction of Banking Facility to Solar Power Plants." KERC. 22 March. Accessed November 23, 2015. <http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2013/OrderOnIntroducingBankingToSolarPlantsFinal-25.03.2013.pdf>.
12. KERC. 2014. "In the matter of: Wheeling charges, Banking charges & Cross Subsidy Surcharge for Solar Power Generators." KERC. 18 August. Accessed November 23, 2015. http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2014/Final_WB_CSS-18-08-2014.pdf.
13. KERC. 2004. "Karnataka Electricity Regulatory Commission (Terms and Conditions for Open Access) Regulations, 2004." KERC. 12 November. Accessed November 23, 2015. <http://www.karnataka.gov.in/kerc/Regulations/Regulations/openaccessregulation/finalopenaccess2004.pdf>.
14. KERC. 2004. "NCE Regulation 2004." KERC. 27 September. Accessed November 23, 2015. <http://www.karnataka.gov.in/kerc/Regulations/Regulations/NCERegulation/KERC%28NCE%29Regulations-2004-final.pdf>.
15. KERC. 2014. "Retail Supply Tariff approved by K.E.R.C. in Tariff Order for the year 2013 -14 for BESCOM." KERC. Accessed November 23, 2015. http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2013/Tariff_Order_2013/TAG_ENGLISH_BESCOM.pdf.
16. KERC. 2015. "Retail Supply Tariff approved by K.E.R.C. in Tariff Order 2015-16 for all ESCOMs except BESCOM." KERC. 02 March. Accessed November 23, 2015. http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2015/TARIFF%202015-16/Retail_Supply_Tariff_2015-16_Non_BESCOM-English-02.03.2015.pdf.
17. KERC. 2014. "Retail Supply Tariff approved by K.E.R.C. in Tariff Order for the Year 2013 -14 for all ESCOMs except BESCOM." KERC. Accessed November 23, 2015. http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2013/Tariff_Order_2013/TAG_ENGLISH_ALL_ESCOMS.pdf.
18. KERC. 2015. "Tariff Order 2015 of BESCOM." KERC. 02 March. Accessed November 23, 2015. <http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2015/TARIFF%202015-16/BESCOM-TARIFF-2015-16.pdf>.
19. KERC. 2015. "Tariff Order 2015 of KPTCL." KERC. 02 March. Accessed November 23, 2015. <http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2015/TARIFF%202015-16/KPTCL-TARIFF-2015-16.pdf>.
20. Khajane, Muralidhara. 2008. The Hindu. 26 September. Accessed November 22, 2015. <http://www.thehindu.com/todays-paper/tp-national/tp-karnataka/celebrating-100-years-of-electricity/article1345585.ece>.
21. KREDL. 2015. "RE Progress Report for the month of October 2015." KREDL. October. Accessed November 2015. <http://kredlinfo.in/General/RE%20cumulative%20report.pdf>.
22. KREDL. 2015. SlidePlayer. Accessed November 2015. <http://slideplayer.com/slide/3355869/>.
23. PwC. 2015. Investors Guide RE-Invest 2015. Issue Brief, PwC.
24. 2014. "Retail Supply Tariff approved by K.E.R.C. in Tariff Order for the Year 2013 -14 for all ESCOMs except BESCOM." KERC. Accessed November 23, 2015. http://www.karnataka.gov.in/kerc/Downloads/COURT-ORDERS-2013/Tariff_Order_2013/TAG_ENGLISH_ALL_ESCOMS.pdf.

This page is intentionally left blank.

This page is intentionally left blank.

ACKNOWLEDGEMENTS

The authors would like to thank the Managing Director (BESCOM); the Managing Director (KREDL); the General Manager (Power Purchase), BESCOM and his team; the Assistant General Manager (Solar Grid), KREDL and his team; the Vice President (Operations), Bangalore International Airport Limited; and all the respondents representing developers and consumers who have requested anonymity, for their active participation and valuable inputs. We would also like to thank Ashwin Gambhir, Disha Agarwal, K.S. Venkatagiri and Ronnie Khanna, for being generous with their time and advice in reviewing this working paper.

The authors would also like to thank Shakti Sustainable Energy Foundation (SSEF); Department of Energy, Government of United States (DOE) and the Caterpillar Foundation for their kind support to the Green Power Market Development Group (GPMDG) initiative. We would like to thank our partner in the GPMDG, Confederation of Indian Industry (CII) for helping build strong relationships with companies that are committed to integrating more green energy. Lastly, we thank our colleagues at WRI who helped us through all times in bringing out this publication. Special mention goes to Anjana Agarwal, Bill Dugan, Eliot Metzger, Daryl Ditz, Divya Kottadiel and Sarah Martin, for reviewing and helping in bringing out this publication. We thank Rekha Raghunathan for copy-editing and proofreading.

DISCLAIMERS

The views and analyses represented in this document do not necessarily reflect that of Shakti Sustainable Energy Foundation. The Foundation accepts no liability for the content of this document, or for the consequences of any actions taken on the basis of the information provided.

This material is based upon work supported by the Department of Energy under Award Number DE-EE0006096. This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

ABOUT WRI INDIA

WRI India is a research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

ABOUT CII

The Confederation of Indian Industry (CII) work to create and sustain an environment conducive to the growth of industry in India, partnering industry and government alike through advisory and consultative processes.

CII - Sohrabji Godrej Green Business Centre (CII Godrej GBC) is one of the 10 Centres of Excellence of CII which offers advisory services to the industry in the areas of Green buildings, Renewable Energy, Energy Efficiency, Water Management, Environmental Management, Green Business Incubation and Climate Change activities. <http://www.cii.in>.

ABOUT THE AUTHORS

Deepak Sriram Krishnan is the Manager of the Green Power Market Development Group, India initiative. His work involves interacting with businesses, regulators, renewable energy developers and financiers to scale up private investment in renewable energy. He is a certified Energy Risk Professional and has worked across the value chain on projects in mining, generation, transmission, distribution and renewable energy. Deepak is an electrical engineering graduate and hold a master's degree in electric power systems from the Indian Institute of Technology, Delhi.

Contact: Deepak.Krishnan@wri.org

Ashok Kumar Thanikonda is a Senior Project Associate in the Climate and Energy Program at WRI India. He has expertise in renewable energy policies and business models. His work in the Green Power Market Development Group, India initiative involves helping corporate businesses increase the share of renewable energy in their energy mix. Ashok holds a Master's in Natural Resources Management from TERI University in New Delhi.

Contact: Ashok.Thanikonda@wri.org

WITH CONTRIBUTIONS FROM



Copyright 2015 WRI India. This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivative Works 3.0 License. To view a copy of the license, visit <http://creativecommons.org/licenses/by-nc-nd/3.0/>