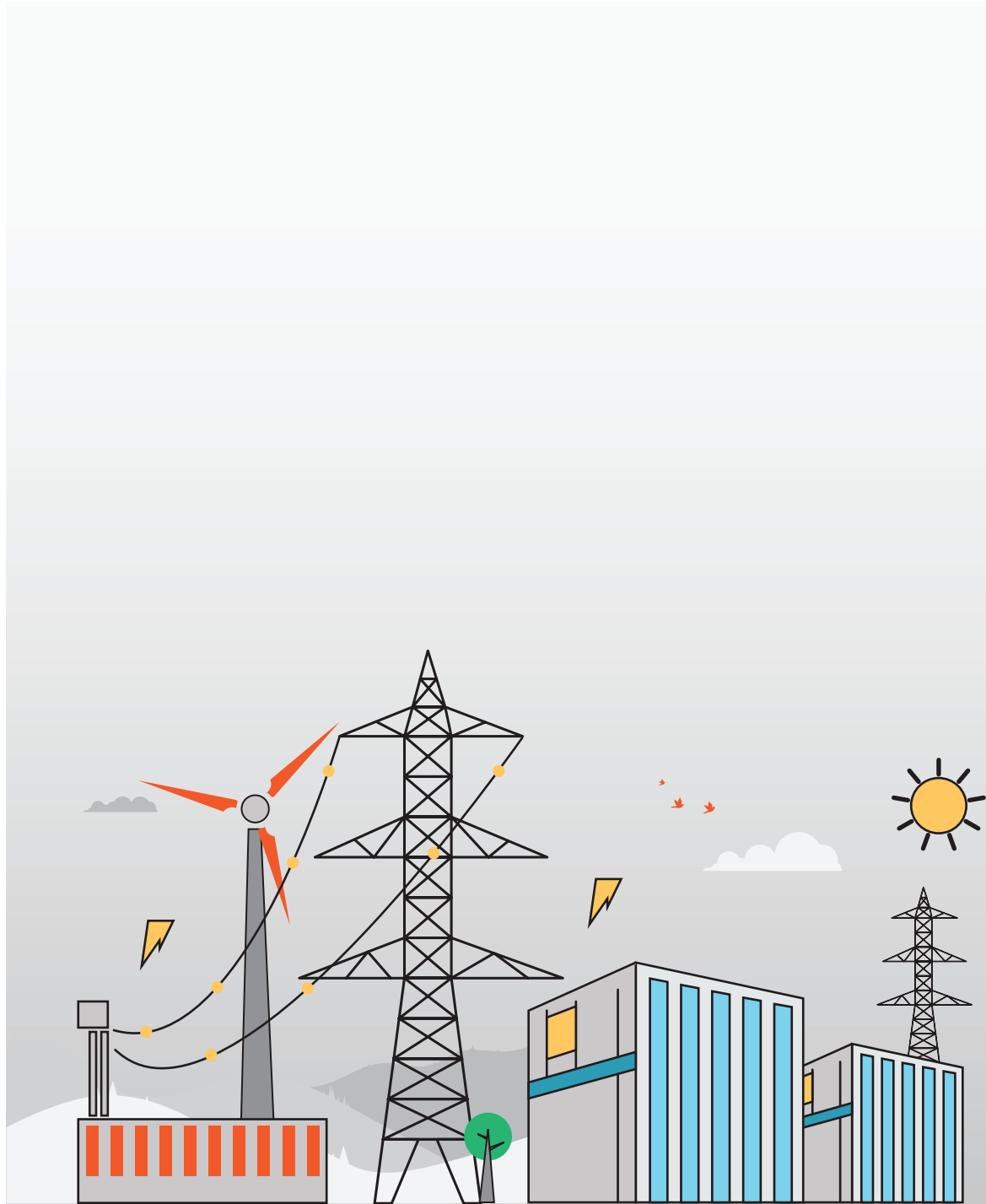


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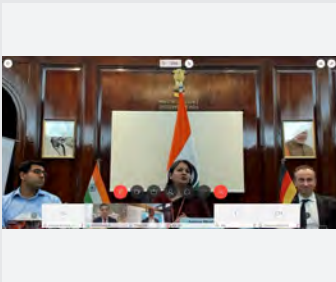
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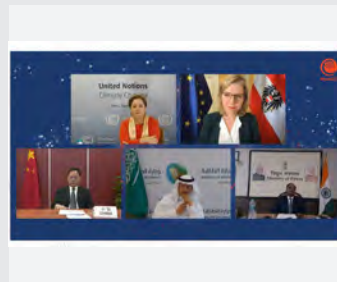
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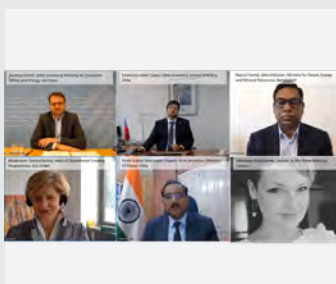
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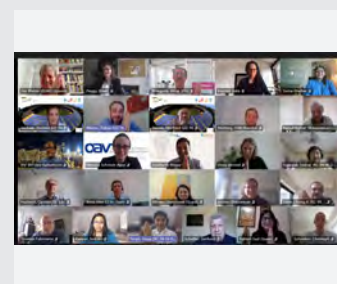
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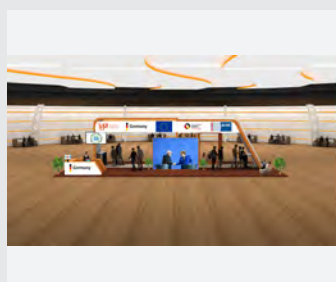
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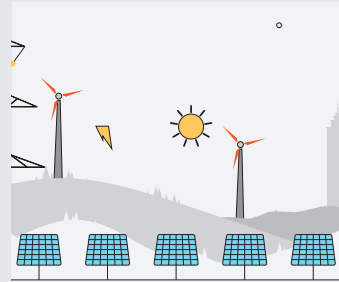
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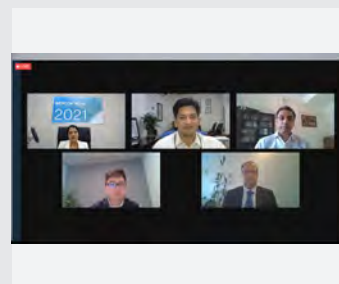
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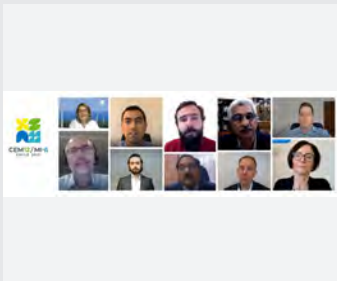
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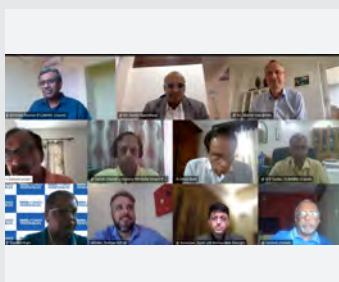
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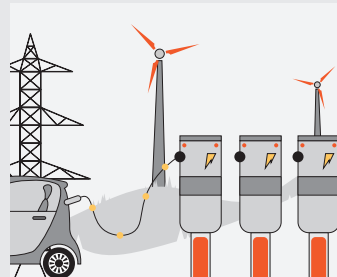
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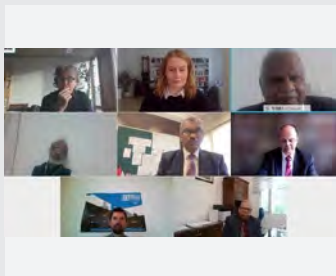
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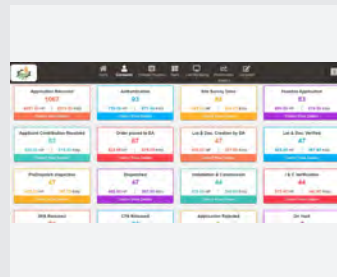
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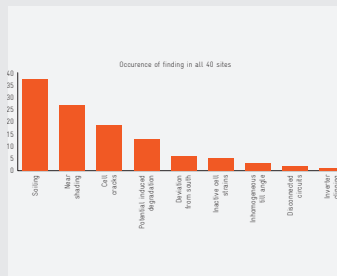
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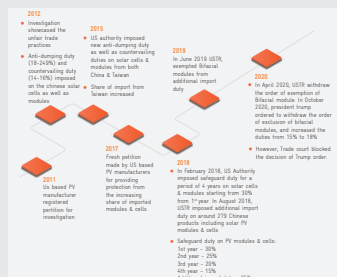
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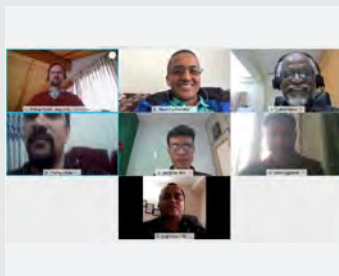
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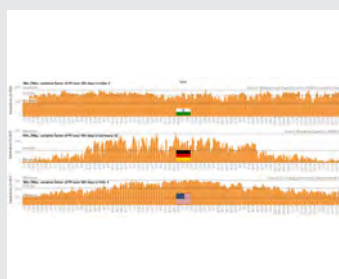
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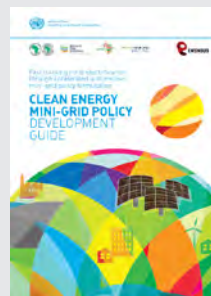
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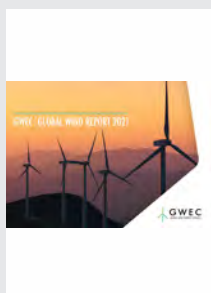
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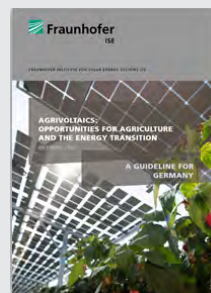
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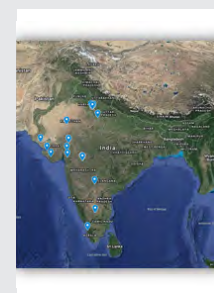
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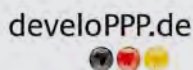
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1

Introduction



His Excellency Dr. Ajay Mathur
Director-General, International
Solar Alliance (ISA)

“ I look forward to welcome Germany as a member of the International Solar Alliance. Let us accelerate the global energy transition together for the benefit of all nations.”

says globally recognised Energy and Climate expert Dr. Ajay Mathur who has been unanimously elected as Director General of ISA.

Dr. Mathur assumed the office in March 2021. Previously, he was Director General of the leading environmental think tank and research organisation TERI and served as a member of India's Prime Minister's Council on Climate Change. Between 2006 and 2016, he was appointed twice Director General of the Bureau of Energy Efficiency (BEE), an agency of the Government of India to promote the efficient use of energy. From 2012 to 2013 he was responsible for the Green Climate Fund in the position of its first Executive Director in Bonn, Germany. Between 1986 and 2000 he held several leading positions in TERI, amongst others as Director Energy & Environment Engineering. Subsequently he led the World Bank's climate change team in Washington, USA from 2000 until 2003. As President of Suzlon Energy Limited he gained deep insights into the private sector from 2004 until 2006. As the new Director General of ISA, Dr. Mathur brings a wealth of leadership and expertise across all key areas of the energy transition, from policy, research, and technology commercialisation to financing, international cooperation, and institutional development. He has been a key Indian climate change negotiator and was the spokesperson for India at the 2015 climate negotiations in Paris.

2

Events and Activities

IGEF Subgroup IV Meeting: Green Energy Grid Integration

12 March 2021 | New Delhi, India

On 12 March 2021, a hybrid meeting of the Indo-German Energy Forum (IGEF) Subgroup IV about “Green Energy Corridors” now renamed as “Green Energy Grid Integration” was held. It was co-chaired by Ms. Aparna Bhatia, Adviser, Bilateral Cooperation, Department of Economic Affairs, Ministry of Finance, Government of India and Mr. Philipp Knill, Head of Division India and South Asia, of Germany’s Federal Ministry for Economic Cooperation and Development (BMZ). The meeting was attended by the officials of DEA, BMZ, German Embassy, KfW, GIZ, MNRE, MOP, PGCIL, POSOCO, CEA and IGEF-SO.

In her welcome address, Ms. Bhatia referred to the six-decades long cooperation between India and Germany. She mentioned that the Flagship Programme of Green Energy Corridors is of great importance and the commitment of € 1.4 Billion to the project is a cornerstone of cooperation between the two countries in the field of renewable energy.

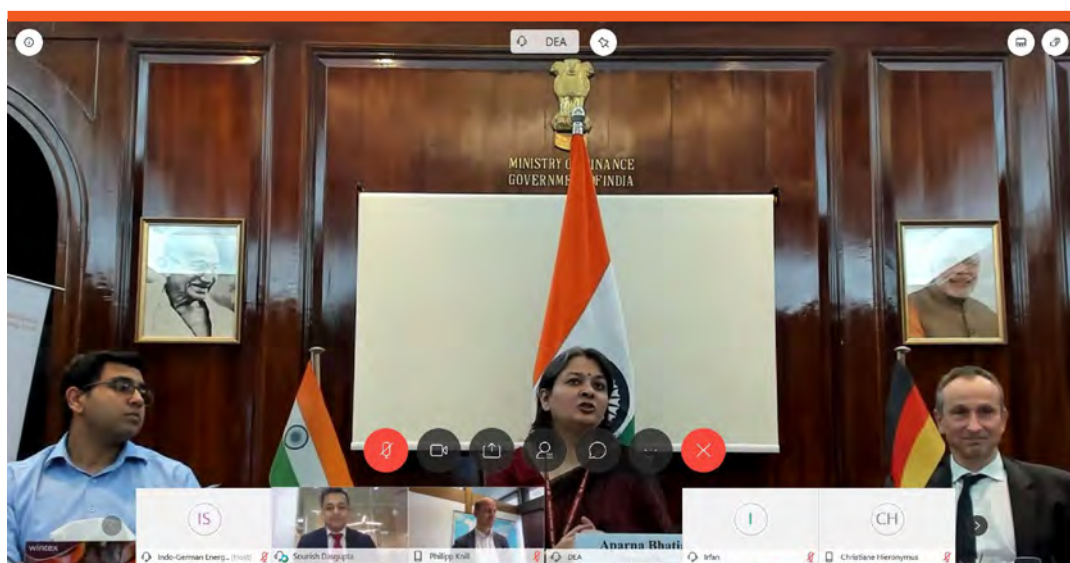
Echoing the views of the Indian Co-Chair that the meeting promised a rich agenda for discussions, Mr. Philipp Knill referred to the upcoming 6th Indo-German Cabinet Consultations

in June 2021. The 50% RE share in net generation in Germany in the year 2020 is a reminder for both sides to make long term plans and to learn from each other’s experiences in integrating RE into the grid. Mr. Knill noted that building the grid infrastructure takes thrice as long as building RE generation projects and hence it is crucial to plan the transmission infrastructure to facilitate the RE transfer.

KfW Development Bank, GIZ and IGEF-SO updated the Co-Chairs of the Subgroup on the progress made regarding decisions taken in the past. PWC gave an update on the latest IGEF study on PSP hydro potential in India with 3 promising states identified for such projects. After inputs from present stakeholders, the following decisions amongst others were made:

- ▶ DEA committed to facilitate communication with nodal ministries and states for ongoing and new studies.
- ▶ Capacity building on electricity market design via VC for interested Indian policy makers and other public sector stakeholders.

Co-Chair Ms. Aparna Bhatia, DEA, Ministry of Finance, Co-Chair Philipp Knill, BMZ and Dr. Martin Lux, KfW.



- ▶ A presentation on recent findings of a study on pumped hydro to be made to all 3 states identified in the latest IGEF report.
- ▶ IGEF Support Office to discuss with MNRE for a potential study on siting of upcoming RE generation projects to minimise the cost of transmission.
- ▶ IGEF Support Office to submit a brief outline about the idea for comparison of costs involved for transporting green electricity via transmission grid over long distances vs. conversion into green hydrogen storage and reversion into electricity via a fuel cell.
- ▶ Further studies with a focus on storage may be carried out if the additional need has been identified after a similar world bank study is finalised and with approval by the competent line ministry.

Change of scope and name of the Subgroup from "Green Energy Corridors" to "Green Energy Grid Integration" in line with the concept paper: Expanding the scope of IGEF Subgroup 4 "Green Energy Corridors" to "Green Energy Grid Integration".



India Points to Great Need for Cooperation on Storage at BETD 2021

16-17 March 2021 | Berlin, Germany

President of the European Commission Ursula von der Leyen, Foreign Minister Heiko Maas and Economic Affairs Minister Peter Altmaier inaugurated the seventh Berlin Energy Transition Dialogue (BETD) 2021. More than 10,000 political decision-makers from all over the world met again in Berlin and virtually, to discuss current challenges of the global energy transition under the motto "Towards Climate Neutrality". The roll-out of a global hydrogen economy as well as other energy storage solutions, the energy transition in the transport sector but also in the building sector were the main topics discussed. On the high level panel "The Green Decade – Road to 2030" on 16 March, Shri Alok Kumar, Honourable Secretary of the Indian Ministry of Power and Co-Chair of IGEF stated

- ▼ Of the major global economies, India is probably the only one on its way to reaching its emission reduction targets.
- ▼ Today, India is the third-largest market for solar in the world.
- ▼ India is increasing its share of renewable energies. But this also requires balancing and storage (...) in batteries or via green hydrogen. (...) India needs a lot of international cooperation to work on these two technologies to further bring down the cost.
- ▼ Regional cooperation is important (...) India calls for the integration of power grids as fast as possible to utilise the advantages of the different time zones (e.g. transportation of solar energy in regions in which the sun has already set) (...) to make solar energy even more profitable.
- ▼ The third most important challenge is the market integration of renewable energies.
- ▼ All new coal fired power plants have to be highly efficient supercritical and ultra-supercritical technologies.
- ▼ Around 228 coal fired power plant units with a capacity of 16 GW have already been shut down.

(L to R) Ms. Patricia Espinosa, Executive Secretary, UNFCCC, Ms. Leonore Gewessler, Minister for Climate Action, Environment, Energy, Mobility, Innovation and Technology of the Republic of Austria, Mr. Shanqing Lin, Vice Minister, National Energy Administration, China, Mr. Abdulaziz Bin Salman, Minister of Energy, Saudi Arabia, and Shri Alok Kumar, Secretary Energy, India and Co-Chair of IGEF.

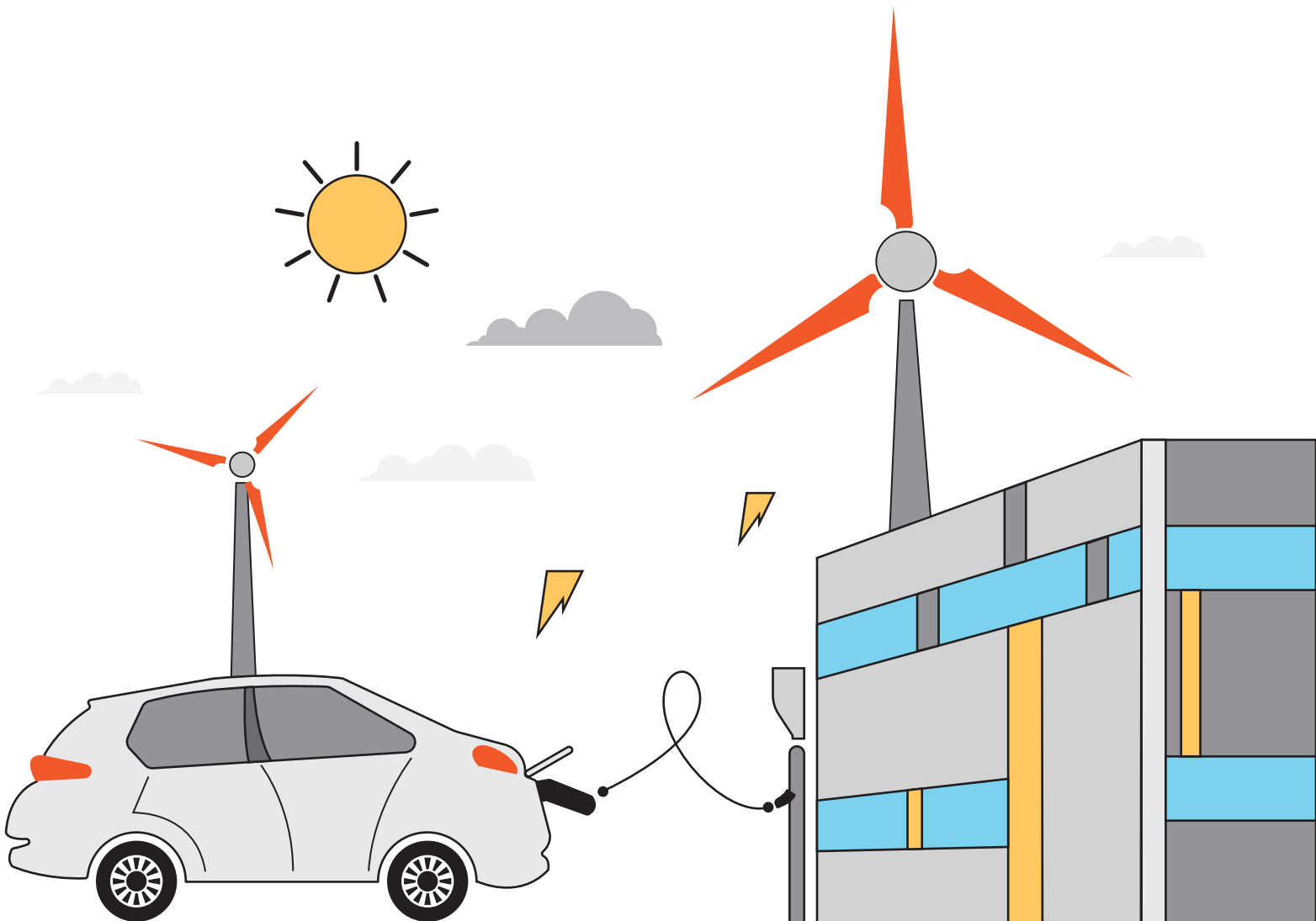


- ▶ We consider making it mandatory for our industry to produce green hydrogen.
- ▶ India is working hard to expand the charging infrastructure for e-mobility.

In conclusion especially in regard to international cooperation, three important challenges were named:

1. Reducing the cost of new technologies, in particular battery and hydrogen
2. Regional cooperation especially on grids. The initiative of the Indian Prime Minister: "One sun, one world, one grid" was named as an excellent example.
3. Effective market integration of renewable energies with India having recently introduced its own market for green power trading.

For more details, please visit:
www.energydialogue.berlin.



“Is coal coming to an end?” Panel Discussion at BETD 2021

16-17 March 2021 | Berlin, Germany

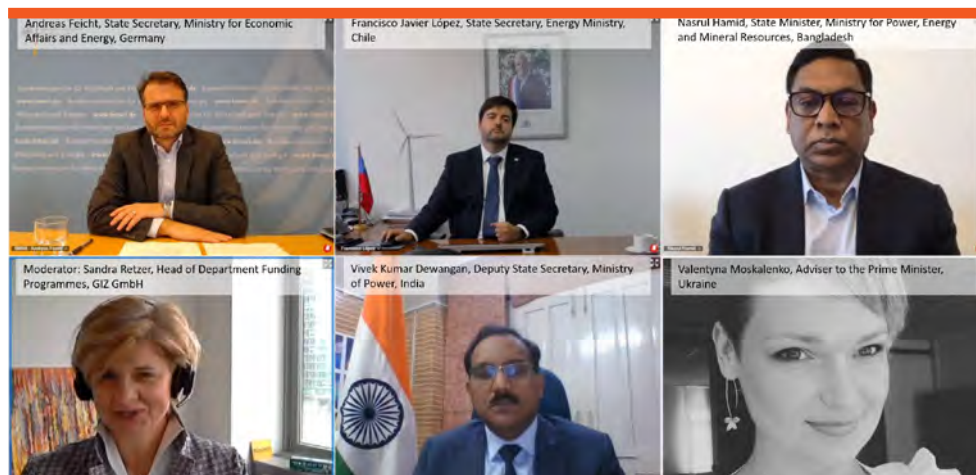
The Berlin Energy Transition Dialogue took place virtually between 16 – 17 March. In light of the international ambitions to stop climate change and reduce coal combustion, five high-level panellists from yet coal-dependent countries discussed possibilities to reduce the role of coal in the respective energy systems. During the event, the speakers took a stand to different opinions expressed by stakeholders from civil society, local policy and business that were shown in short video clips. The German Federal Ministry of Economic Affairs and Energy (BMWi) hosted the panel discussion “Is coal coming to an end? Structural changes for a decarbonised future”. Among the participants were Secretary of State Mr. Andreas Feicht, BMWi and Shri Vivek Dewangan, Additional Secretary of the Indian Ministry of Power (MoP). Key statements by the Government of India were:

- ▶ India aims for 175 GW renewable capacity by 2022 and 450 GW renewable capacity until 2030.
- ▶ India cannot assume that renewables will be available 24/7, 365 days a year.
- ▶ Due to limited availability, natural gas is not an alternative.
- ▶ India is still reliant on coal power.
- ▶ Battery technology and green hydrogen can reduce India’s dependency on coal.

This requires massive dissemination of technologies to reduce costs. This can be achieved via green financing and the implementation of more pilot projects.

- ▶ As long as India has no cheap storage technologies, up to 40% of the power plant capacity is projected to remain coal based until 2030.
- ▶ To ensure grid stability, a lot of flexibility in the coal power plant fleet is necessary.
- ▶ Together with the Indo-German Energy Forum, the US and Japan, the Government of India is working constantly to increase the flexibilisation of coal-fired power plants.
- ▶ An important aspect is the regional grid integration with neighbouring countries, like Bhutan, Myanmar, Nepal and Bangladesh.
- ▶ In previous years, 16 GW coal fired power plants were shut down, and India is constantly evaluating which plants could follow next.
- ▶ A green hydrogen mission is supposed to start in the coming six months.
- ▶ India will be hosting the G20 in 2023.

Participants in the session “Is coal coming to an end? Structural changes for a decarbonised future”.



Local Business Advisory Council on Green Hydrogen

19 May 2021 | Virtual

On 19 May, the Local Business Advisory Council under the Indo-German Energy Forum met to discuss potential opportunities in large scale green hydrogen production in India. Ms. Peggy Schulz, Deputy Head of Division in the German Ministry for Economic Affairs and Energy (BMWi) presented upcoming German funding guidelines for international green hydrogen projects. The national hydrogen strategy of Germany published in June 2020 is part of the green recovery package in reaction to COVID-19. The Government of Germany has committed more than 9 billion Euros to support the establishment of a hydrogen economy. One billion Euro is foreseen for green hydrogen project developments outside Europe. One of the goals of the national hydrogen strategy is to establish 5 Gigawatt (GW) of electrolyser capacity until 2030 and 10 GW of electrolyser capacity until 2040 in Germany. In this meeting,

Ms. Schulz elaborated how a German company can benefit from this substantial financial support for their hydrogen projects developed in India. This is because it is a global effort to bring down the cost of hydrogen and Germany will remain a net importer of energy in a climate neutral world. Mr. Stefan Halusa, Managing Director of the Indo-German Chamber of Commerce (IGCC) of foreign trade in India welcomed the participants and kindly offered to arrange for further meetings to promote and specify possible hydrogen projects in India. Participants at the Local Business Advisory Council were German companies, business associations, representatives from the BMWi, the AHK in India, Germany Trade and Invest (GTAI), the Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Indo-German Energy Forum Support Office (IGEF-SO).

Participants of the 4th Local Business Advisory Council on Green Hydrogen.



German Pavilion at India Smart Utility Week 2021

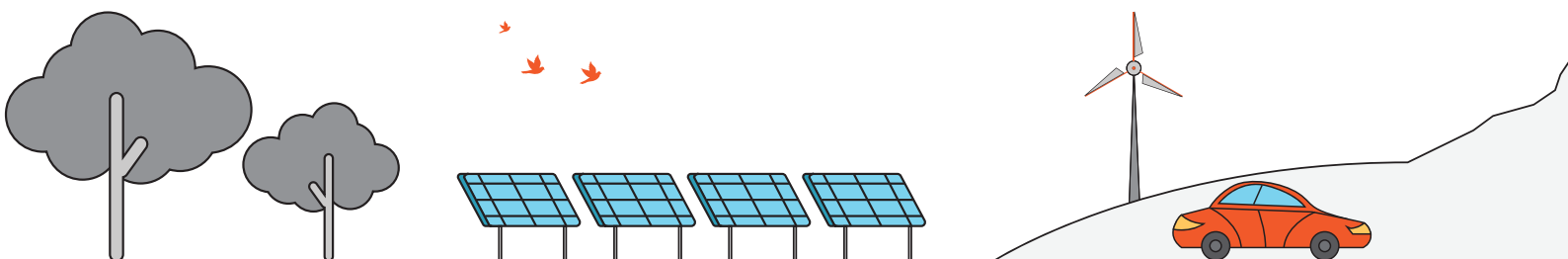
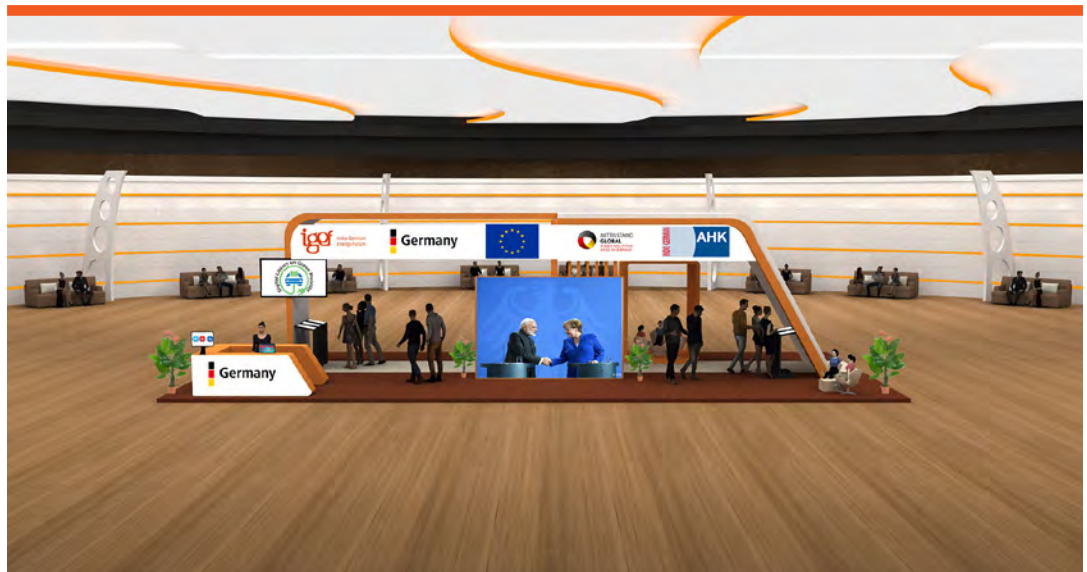
2-5 March 2021 | Virtual

India Smart Utility Week 2021 (ISUW) was held on 2- 5 March 2021. Conducted on a digital platform, it served as an International Conference and Exhibition on Smart Energy and Mobility for Smarter Cities. The EU and its member states partnered with ISUW 2021. In the 10th EU-India workshop on Smart Grids regulators, policymakers, electricity utilities, investors, smart energy experts, and researchers participated in a panel discussion on "Competition and Market Functioning in the Power Sector in India: Enablers for India's

renewables transition." Among others, Mr. Matthis Brinkhaus from Energy Brainpool gave insightful inputs on electricity trading in Europe. The Indo-German Chamber of Commerce in collaboration with the Indo-German Energy Forum (IGEF) Support Office organised a virtual German Pavilion in the European zone at the event.

Get to know more about electricity trading in Europe watch the presentation of Mr. Brinkhaus [here](#).

Virtual German Pavilion jointly organised by IGCC and IGEF-SO at India Smart Utility Week 2021.



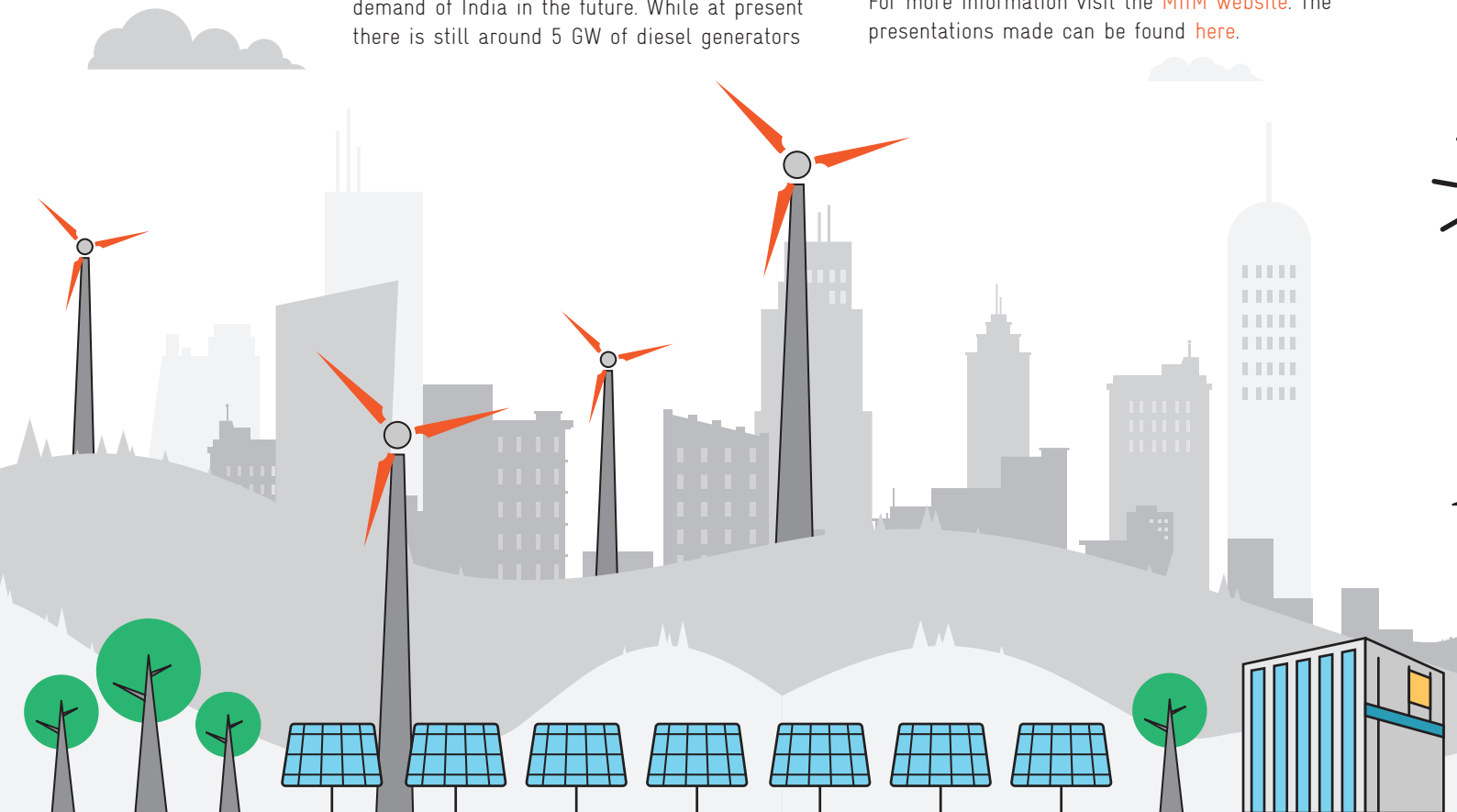
Insights and Opportunities in Solar and Energy Storage in India

24 March 2021 | Virtual

On 24 March 2021 the Indian Embassy in Germany, the National Solar Energy Federation of India (NSEFI) and the Indo-German Energy Forum Support Office (IGEF-SO) supported a webinar on "Insights and Opportunities in Solar - PV Modules and Energy Storage" as part of the initiative "Make in India Mittelstand". German companies from the solar sector were shown upcoming business opportunities as well as the challenges of entering the Indian market. Mr. Tobias Winter, Director of the IGEF-SO presented fast growing niche markets for photovoltaics and battery storage. As per the latest findings there is more than 120 GW of diesel generators installed in India. At the same time, India has one of the highest solar energy security levels in the world. "Somewhere in India the sun is always shining" stated Mr. Winter. Even the day with the lowest solar power generation would be able to cater the entire daily electricity demand of India in the future. While at present there is still around 5 GW of diesel generators

being sold in India per year, this market segment may be disrupted by battery storage faster than many may be willing to believe. Especially in combination with solar energy, there is an enormous market development foreseen in India. Mr. Anup Barapatre from EAC International Consulting highlighted the enormous potential for Make in India in the entire photovoltaic value chain. Despite India being the most attractive solar energy market in the world, there is still no polysilicone or solar ingot manufacturing in India. Several existing and upcoming promotion schemes to support investments in manufacturing in India were highlighted. Amongst others, the "Make in India Mittelstand" initiative by the Embassy of India and the "Exportinitiative Energie" by the German Federal Ministry for Economic Affairs and Energy were highlighted.

For more information visit the [MIIM website](#). The presentations made can be found [here](#).



Summit of the Powering Past Coal Alliance (PPCA)

2-4 March 2021 | Virtual

The Powering Past Coal Global Summit 2021 between 2-4 March was the largest global meeting on the issue of “Exit from Coal Power” this year. National governments, regional and city representatives, banks, investors, energy companies and grid operators, researchers, NGOs as well as youth and health advocates came together to discuss their experiences and

best practices regarding coal exit. On 4 March, a “Deep dive on policy change processes towards no new coal” took place, where Shri Ashok Kumar, the Deputy Director General of the Indian Bureau of Energy Efficiency (BEE) actively participated. Indo-German Energy Forum Support Office (IGEF-SO) supported the event.

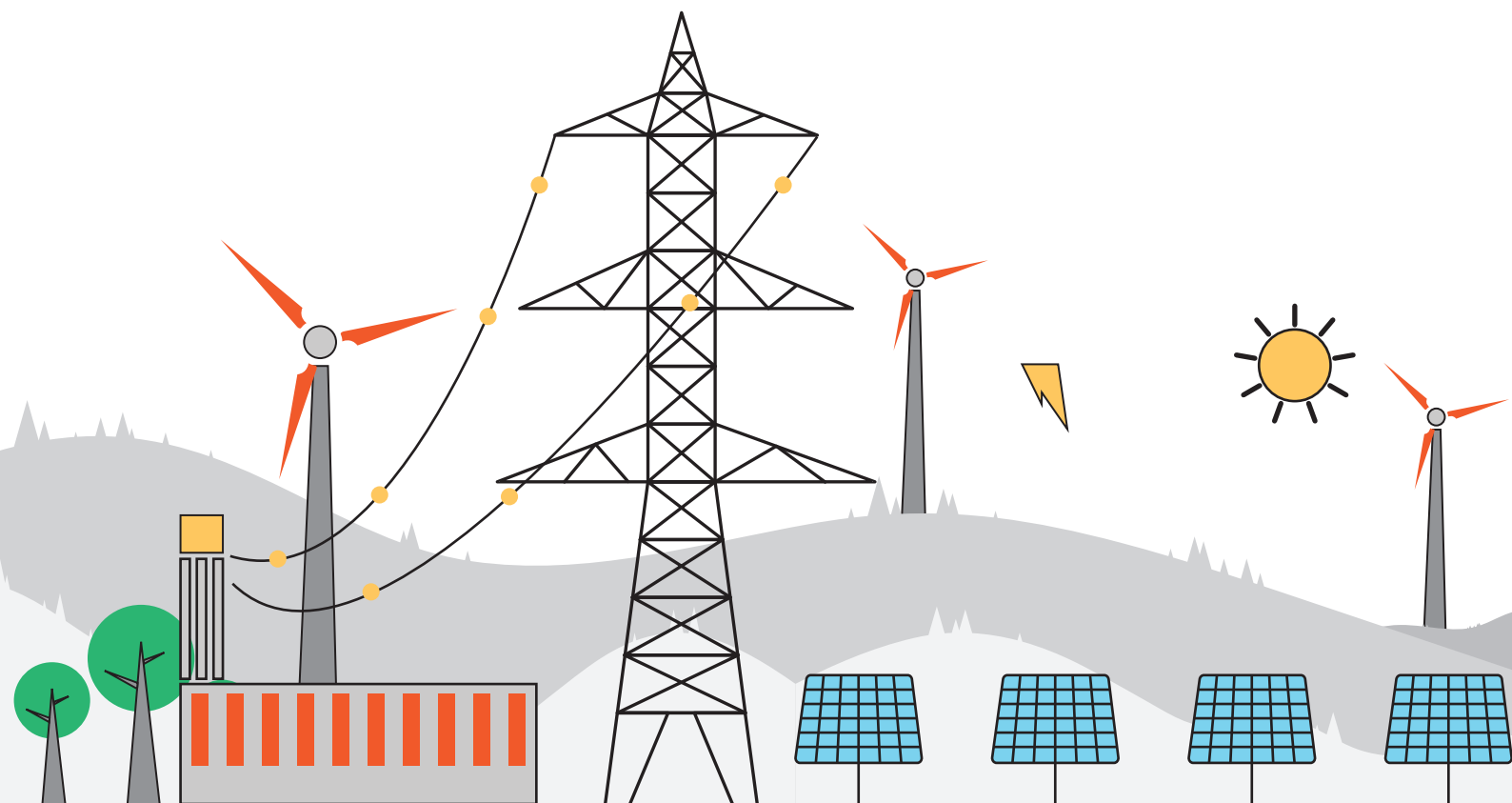


Workshop on Combined Wind and Solar Auctions

2 March 2021 | Virtual

On 2 March, the German-Brazilian Energy Partnership organised a workshop on “Combined Wind and Solar Auctions”. The focus was on exchanging experiences with regard to the most important decisions in designing an auction for combined wind and solar power plants. Speakers

were, among others, Mr. Shailesh Kumar Mishra, Director (Ps) at Solar Energy Corporation of India (SECI) who elaborated on the original motivation and situation of combined auctions in India and how the sector has developed since then.



Stationary Energy Storage India (SESI) 2021

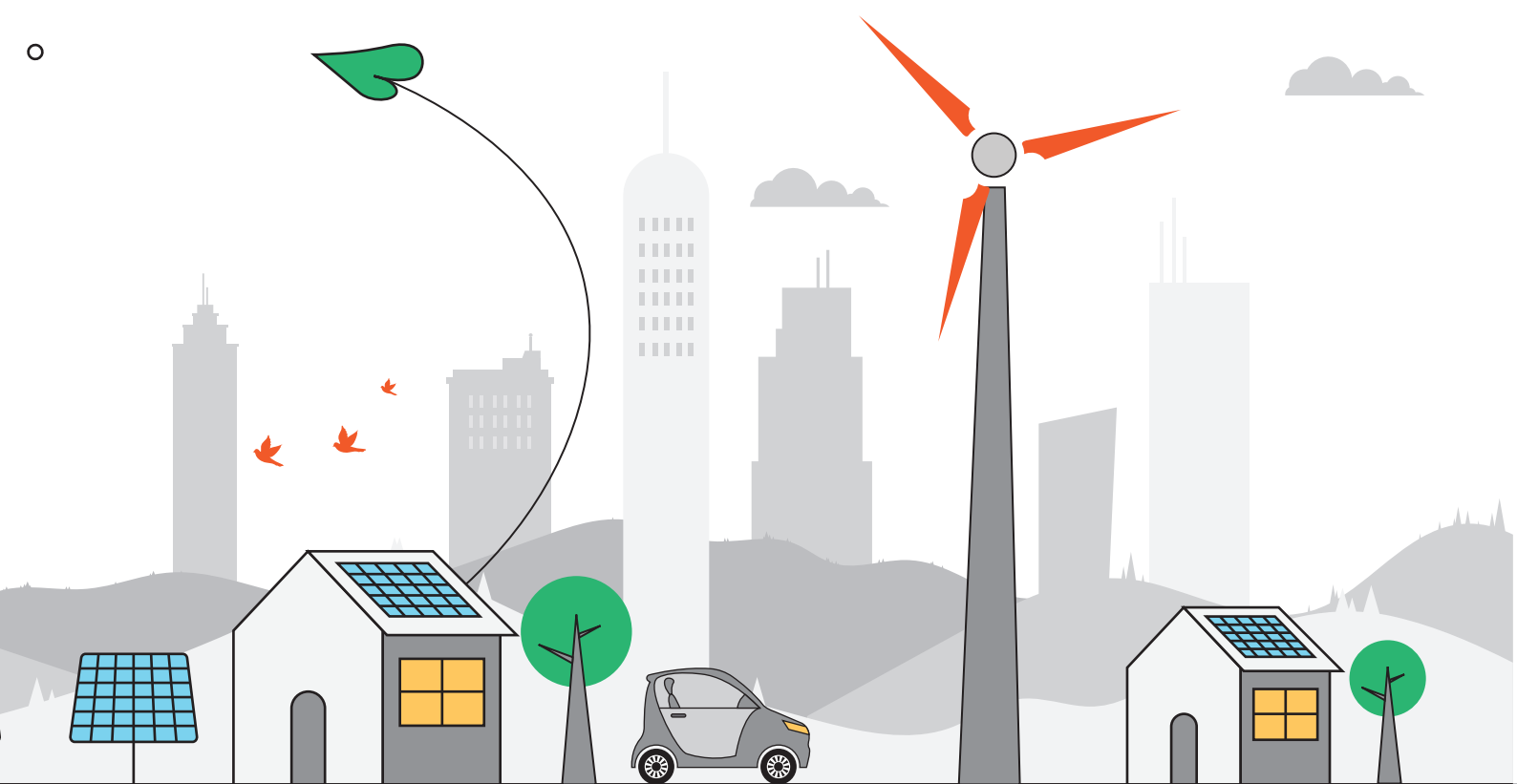
8 April 2021 | Virtual

India Energy Storage Alliance (IESA) successfully concluded its flagship annual event: Stationary Energy Storage India (SESI) 2021 on 8 April. The day-long conference & virtual expo brought policy makers, senior corporate executives, researchers, and entrepreneurs on a single platform to deliberate on the roadmap and outlook for stationary energy storage in India and the market landscape for the future. The event was supported by the Indo-German Energy Forum (IGEF). The event was attended by 300+ delegates. IESA and the National Solar Energy Federation of India (NSEFI) announced a joint task force on solar-plus storage. The partnership aims to work on policy advocacy with the State and the Central Government, information dissemination and creating useful reports and analysis on the solar plus storage sector in India.

Some excerpts from the eminent dignitaries and industry pioneers:

Ghanshyam Prasad, Joint Secretary, Ministry of Power (MoP): There is a lot of scope of stationary energy storage at a small-scale and distribution level and if India is able to plan it, there will be huge savings and huge potential for storage.

Jatindra Nath Swain, Managing Director, Solar Energy Corporation of India (SECI): If we undertake financial engineering, the storage sector can become really attractive. We have to look at how we can bring down the cost. By lowering risks associated with energy storage projects, and whether we can think of reducing equity components in these projects. These aspects have to be explored.



Mercom India Solar Summit 2021

8-9 April 2021 | Virtual

Mercom India hosted its flagship event Mercom India Solar Summit on 8-9 April. It brought together industry leaders to share insights and advance the course of India's solar industry. The Indo-German Energy Forum (IGEF) presented its activities with a designated booth. The summit was attended by more than 8000 delegates.

In a number of high-level sessions, participants discussed a broad range of issues, including the manufacturing of solar modules and cells, supply chains, financing, and future paths for large-scale project development.

In the session "Solar Modules to Make or Not to Make in India?" Shri Amitesh Kumar Sinha, Joint Secretary of the Ministry of New and Renewable Energy (MNRE) elaborated with distinguished representatives from the private sector on the Indian government's "Make in India" policy. He pointed out that the MNRE encourages the private sector to participate in the production

linked incentives scheme (PLI) which includes support for foreign manufacturers who want to invest in India. He also stressed the importance of R&D and MNRE's willingness to support industry and academia collaboration.

In the session "Solving the Jigsaw Puzzle" investors and developers discussed the challenges involved in financing solar projects, including the barriers and incentives to invest in India over other markets. Among the distinguished participants, Dr. Martin Lux, Head of Energy at the KfW in Delhi emphasised the enormous potential of India's huge market for achieving substantial carbon dioxide reductions: "In the future, we will need new financial mechanisms in India to finance an exit from coal."

For the findings of the summit click [here](#). To watch the recordings of the individual sessions, please click [here](#).

(L to R) Ms. Priya Sanjay, Mercom, Mr. Amitesh Kumar Sinha, MNRE, Mr. Ranjit Gupta, Azure Power, Mr. Daniel Liu, Jinko Solar, Mr. Avinash Hiranandani, RenewSys India.



CEM12/MI6 Hosted by Chile - Three Years of Power System Flexibility

31 May - 4 June 2021 | Virtual

As part of the Clean Energy Ministerial 12 (CEM) and the Mission Innovation 6 (MI), the side event "Three years of power system flexibility" brought together different perspectives from around the globe on flexiblising power systems to tackle the challenge of climate change.

Shri Vivek Kumar Dewangan, Additional Secretary of the Indian Ministry of Power (MoP), stressed India's ambitious renewable energy targets. The share of coal fired power plant capacity is projected to be reduced below 40% until 2030 though coal will remain important for balancing the power system. Thus, the flexibility of the power generation sector will be key for India's energy transition. Shri Ramesh Babu, Director (Operations) of NTPC, likewise emphasised the necessity to adjust existing systems due

to increasing variations during the day which are of major concern to power producers and grid operators. Dr. Claudia Weise, Project Head at VGB PowerTech e.V., underlined the ongoing studies and flexibility test runs under the umbrella of the Indo-German Energy Forum to test the technical feasibility of flexible power plants at different locations in India. Dr. Winfried Damm, Head of Energy at GIZ India, pointed out that these tests prove the technical feasibility. A challenge remains the economic viability of flexibilisation in India. Most important is to bring power plant operators on the same page to make them "Flexexperts" - experts in flexibility.

For more information and to watch the video of the session, please click [here](#).

Additional Secretary,
Shri Vivek Kumar
Dewangan, MoP, Dr.
Claudia Weise, Project
Head, VGB PowerTech,
Germany, Shri Ramesh
Babu, Director
(Operations), NTPC, Dr.
Winfried Damm, Head of
Energy, GIZ India, and
other experts speaking
on power system
flexibility.



Knowledge Session on Decentralised Green Hydrogen Production

2 June 2021 | Virtual

In the stationary storage, segment hydrogen extends the benefits from battery storage. It's not an either-or but a joint partnership of these clean energy technologies, said Dr. von der Ohe from the German NOW GmbH. On 2 June 2021 Indo-German Chamber of Commerce (AHK) and Indo-German Energy Forum (IGEF) jointly organised a virtual knowledge session on "Decentralised Green Hydrogen Production". Dr. Nicole Glanemann, Deputy Head of the Division for Bilateral Energy Cooperation of the German Federal Ministry for Economic Affairs and Energy (BMWi) inaugurated the session. Experts from NOW GmbH, Enapter GmbH and SFC Energy AG presented different innovative use cases. Mr. Rohit Prasad from Enapter GmbH explained that their scalable electrolyser technology for residential and commercial

clients is already commercially available in India. The company is further bringing down the cost of electrolyser technology globally by mass production. Dr. von der Ohe from NOW GmbH elaborated on the potential of stationary fuel cell technology and the different funding schemes available for decentralised hydrogen production. The replacement of diesel gensets by green hydrogen applications was the focus of the discussions. Mr. Rucker from SFC Energy AG pointed out that one client in India was able to replace 9.000 litres of diesel with less than 400 litres of methanol per year using SFC fuel cell technology. More than 300 persons participated in this session.

The presentations can be viewed [here](#).

(L to R) Dr. Nicole Glanemann (BMWi), Dr. Julius von der Ohe (NOW GmbH), Mr. Rohit Prasad (Enapter GmbH), Mr. Christian Rucker (SFC Energy AG).



The poster features a light blue background on the left and a dark blue background on the right. The title "Decentralised Green Hydrogen Production" is prominently displayed in large, bold, black font. Below the title, the date and time are listed: "Wednesday | 2nd June 2021", "15.00 pm - 16.30 pm IST", and "11.30 am- 13.00 pm CEST". On the right side, four circular headshots of the speakers are arranged in a 2x2 grid. Each headshot is accompanied by the speaker's name and title in white text.

Name	Title
Dr. Nicole Glanemann	Deputy Head, Federal Ministry for Economic Affairs and Energy (BMWi) Government of Germany
Dr. Julius von der Ohe	Head of Programme International Energy Concepts NOW GmbH
Mr. Rohit Prasad	Business Development Manager Enapter GmbH
Mr. Christian Rucker	Business Development Manager SFC Energy AG

Webinar Series on Repowering of Old Wind Farms in India

7, 18, 25 May 2021 | Virtual

Around 25% of the currently installed wind capacity in India is 20 years old and blocks the best locations in the country. According to an IGEF study, around 4 times more wind energy could be generated on these sites if the old turbines were replaced with new ones.

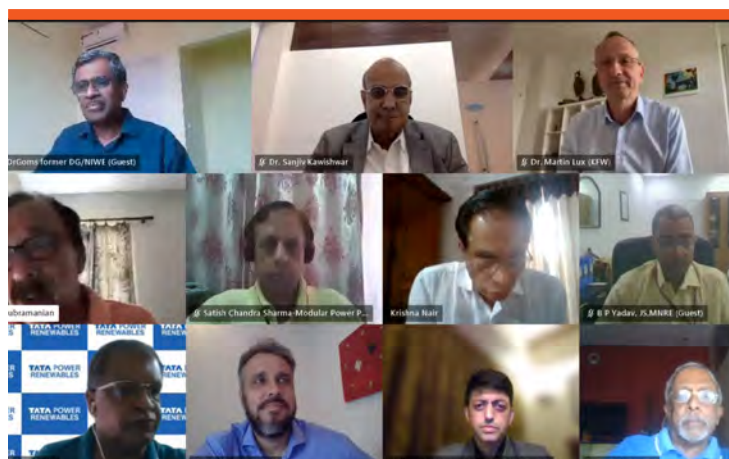
This is why the Indo-German Energy Forum (IGEF) along with KfW Development Bank, Indian Renewable Energy Federation (IREF) and the Indian Wind Energy Association (InWEA) organised a series of webinars on the important topic of repowering of old wind farms in India. The objective of the webinars was to discuss the issues and challenges which resulted in very few repowering activities in India so far. The goal is to come up with possible strategies to overcome existing bottlenecks. The webinars took place with participants from different regions. One was carried out for the central & northern region, one with participants from the western region and one with participants from the south.

Shri D.D. Jagdale, Joint Secretary (International Relations), MNRE in his inaugural address made clear that MNRE is open to new ideas and inputs to accelerate the Repowering of Wind in India. Dr. K. Balaraman, Director General, NIWE stated that the “Repowering of wind is extremely important because land is a constraint and

natural capital has to be optimized”. Mr. B. P. Yadav, Joint Secretary, Wind MNRE delivered the inaugural address at the final webinar of the series. He agreed that repowering of old wind turbines remains one of India’s unsolved problems. His ministry MNRE is open to any suggestions for promising business models who support repowering in India.

All three webinars were followed by a Q&A session at the end. The following panellists actively participated in the webinar series: Shri B. P. Yadav, Joint Secretary Wind, MNRE; Shri D.D. Jagdale, Joint Secretary International Relations, MNRE; Mr. V. Subramanian, Former Secretary, MNRE; Mr. Anand Kumar, Former Chairman, GERC; Dr. K. Balaraman, Director General, NIWE; Dr. S Gomathinayagam, Former DG, NIWE; Mr. M. P. Ramesh, Former DG, NIWE; Mr. K. R. Nair, President, Indian Wind Power Association; Mr. D. V Giri, Secretary General, IWTMA; Dr. Martin Lux, Head Energy Cell, KfW; Mr. Tobias Winter, Director, IGEF-SO; Mr. Ayon Banerjee, Sales Head, GE Renewable Energy; Mr. Balawant Joshi, Managing Director, Idam Infra; Mr. Ajit Pandit, Director, Idam Infra; Dr. Sanjiv Kawishwar, Director, Center of Renewable Energy (CORE); Mr. U. B Reddy, MD, Enerfra Projects India Pvt. Ltd; Mr. Srinivas Krishnaswamy, CEO, Vasudha Foundation.

Mr. B. P. Yadav, Joint Secretary, Wind MNRE delivered the inaugural address at the final webinar of the series.



3

Developments in Indo-German Energy Cooperation



Energy Sector Dialogue between India and Germany

In the framework of the intergovernmental negotiations on development cooperation between the Government of the Republic of India and the Government of the Federal Republic of Germany, the Ministry of New and Renewable Energy (MNRE) and the Federal Ministry of Economic Cooperation and Development (BMZ), recently held a virtual sector dialogue. From the Indian side, the discussions were led by Shri Aniruddha Kumar, Additional Secretary, MNRE. From the German side, the discussions were led by Mr. Philipp Knill, Head of Division Asia and South Asia, BMZ.

Both sides agreed that Indo-German cooperation for promoting the Energy Transition has been fruitful and called for more intense and closer cooperation to address the common goal of increasing access to sustainable energy, reducing carbon emissions and mitigating climate change. The Indian side highlighted that the energy transition has been one of the top priorities despite the COVID-19 crisis. All agreed that the COVID-19 pandemic also can be viewed as an opportunity to transition to alternate technologies like offshore and hydrogen. The German side gave insights in its decision to phase out coal power, increase RE penetration, green recovery measures and the EU climate goal of achieving carbon neutrality by 2050.

In addition to the mutual goal of promoting the energy transition, Germany is offering an intensified cooperation with India as a global partner. Such a partnership would aim at achieving climate goals and SDGs jointly in different sectors like urban development, agriculture and natural resources management

and certainly as well in the energy sector. It would broaden the scope of work and build upon the dialogue under the Indo-German Energy Forum with its exchange on lessons learned, private sector cooperation, involvement of think tanks and more.

The priority topics where the Indian and German side identified possibilities of future cooperation included transmission infrastructure for evacuation of renewable energy from Leh-Ladakh region in India, solarisation of cities, innovative PV applications, promotion of high quality solar investments, decentralised cold storage at farm level, solar rooftop and further support to the KUSUM scheme. Special emphasis was also laid by the German side on the need of reforms or innovative financing instruments to mitigate the payment risk and boost the confidence of renewable energy investors and sector coupling for promoting electric mobility in India. Both sides agreed that the areas of charging infrastructure for EVs, battery storage, pump storage hydro projects, would be important to ensure flexibility in grid operation. Topics which will be explored for future cooperation. Both sides highlighted the important role of IGEF along with the different implementing agencies of Indo German Development Cooperation in the Energy sector. The ongoing partnership between India and Germany through complementary support by KfW, GIZ and Germany's National Metrology Institute PTB in Financial Cooperation and Technical Cooperation can be considered a best practice in development cooperation worldwide. Both sides agreed to follow-up and to support each other in an effort to make the planet clean and green.

GIZ Signed MoU with Govt. of Goa to Develop Multi-Sectoral State Energy Plan

19 March 2021 | Goa, India

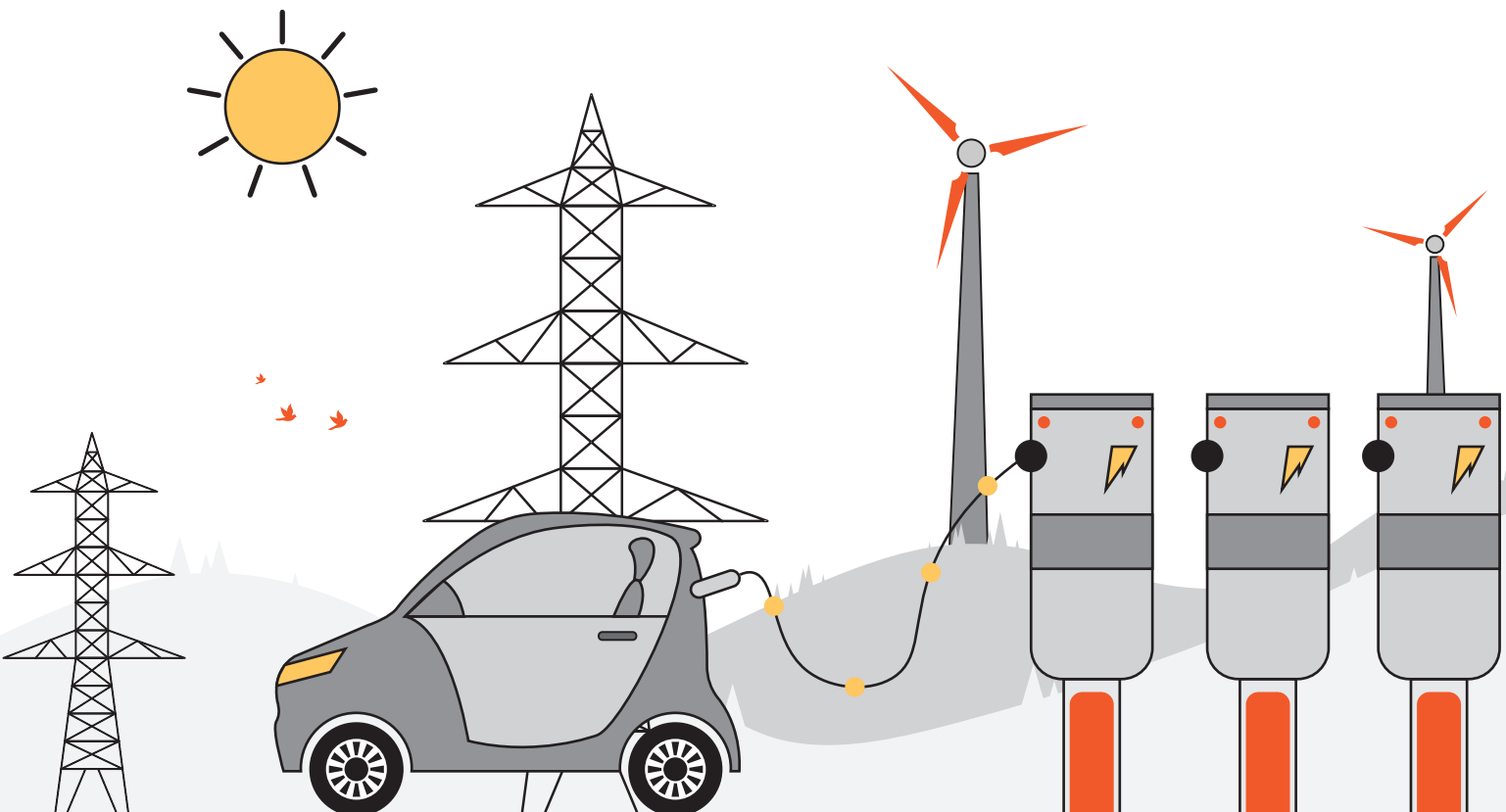
Under the IGEN Access-II program of GIZ India, a memorandum of understanding (MoU) was signed with the State Government of Goa for developing a multi-sectoral strategic energy plan with a 100% Renewable Energy roadmap for the state. A strategic unit will be formed, which will act as a think tank to own, implement and update the action plan. Goa Energy Development Agency (GEDA) will lead the planning process on behalf of the State and will also act as a repository of the state energy database and decision support tool.

Before signing the MoU, GIZ had a detailed discussion on the importance and methodology of developing a state energy plan, with Secretaries

of all key departments in the presence of Chief Secretary Shri Parimal Raj, IAS.

Shri Kunal, IAS, Secretary Power and Non-Renewable Energy; Shri Aleixo F. Da Costa, Director Dept. of New and Renewable Energy and Shri Sanjeev Joglekar, Member Secretary, represented the Government of Goa. Dr. Winfried Damm, Programme Director of the Energy Cluster, Ms. Nidhi Sarin, Lead-IGEN Access-II program and Mr. Manoj Mahata, technical expert, represented GIZ India.

For further information please contact Ms. Nidhi Sarin, nidhi.sarin@giz.de.



Innovative Charging Technologies for Heavy Duty Vehicles (IChargeHDV)

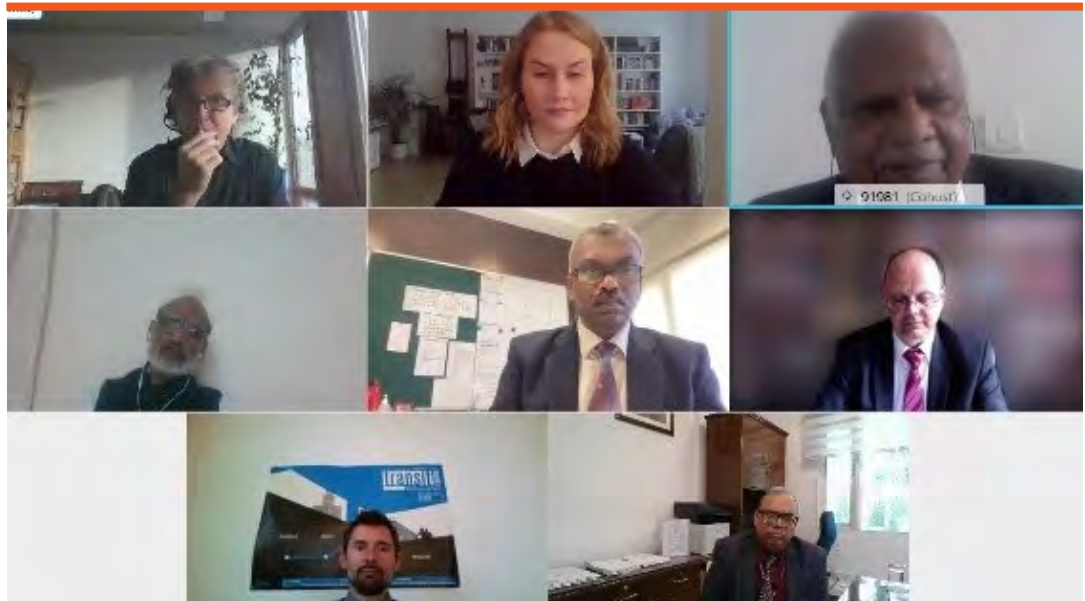
18 February 2021 | Virtual

The Indo-German workshop on innovative charging technology for heavy duty vehicles (IChargeHDV) was organised on February 18, 2021, by ifeu – Institut für Energie- und Umweltforschung Heidelberg GmbH and The Energy and Resources Institute (TERI), New Delhi. The workshop co-ordinators were Mr. Sharif Qamar, TERI and Udo Lambrecht, ifeu. It aimed to provide a platform for policy makers, infrastructure developers, research and development institutes, and leading industry players in freight transport technology and rolling stock supply to advance industrial research partnership in catenary truck technology, which is of interest for both nations. This IGSTC supported joint workshop, intended to

enable stakeholders to share on-field experience in the sector, combined with an overview of strategies to support each other in reducing the GHG emissions and pollutants from the freight transport sector. The workshop is one of the few first steps towards enhancing the technological partnership between nations under the ongoing bilateral projects like promotion of transformation to sustainable and climate friendly electro mobility by networking young scientists from India & Germany.

For more details, please contact Mr. Sharif Qamar Sharif.Qamar@teri.res.in or Mr. Udo Lambrecht udo.lambrecht@ifeu.de.

Welcome address of
the workshop.



Digital Monitoring of PM KUSUM Implementation

The Ministry of New and Renewable Energy (MNRE) through the Pradhan Mantri Kisan Urja Suraksha Evam Utthan Mahabhiyan (PM KUSUM) scheme supports the massive deployment and solarisation of the agricultural sector. The number of solar pump installations under the PM KUSUM has already reached more than 24,600. More than 4,800 MW installations of decentralised grid connected solar power plants are at different stages of implementation. Monitoring the implementation of the scheme will identify remaining challenges and enable a comparison of the performance across geographies and time.

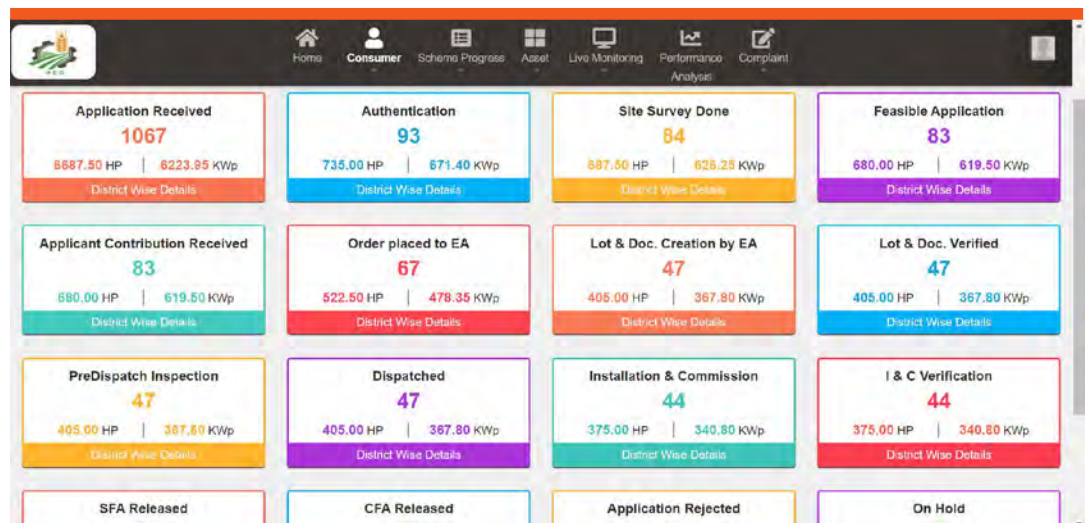
The Promotion of Solar Water Pumps (PSWP) component under the Indo-German Energy Programme (IGEN) of GIZ India is supporting the Government of India in developing digital portals for integration in a national Solar Energy Data Management (SEDM) portal. This will enable MNRE to further improve the progress monitoring of the scheme. Specific state portals are providing data such as the number of solar pumps installed, pump type (AC/DC) or subsidy disbursement as well as technical parameters such as water discharged, pump run hours and more. While the business process data is

collected through a site survey app and a site inspection app by State Implementation Agency (SIA) officials as on progress, the technical data will be collected in real-time via internet based remote monitoring system integration. The archived data is available to state and district level officials with granular performance metrics which are then summarised and sent to the national portal for high-level national view of PM KUSUM's progress.

The portal along with the farmer mobile app enables farmers to check the status of their application, grievances, and individual pump performance. The real time data is stored in servers provided by the states under the respective State Implementing Agencies. The main features of the portal include Consumer Management, Asset Management, Scheme Progress Management, Dashboard for Live Asset Monitoring, Performance Analysis, Management Information System and more. Analysis of the data being collected and stored will help to understand and address the current challenges in ensuring energy and water security in India.

For further information please contact Mr. Prasun Kumar Das prasun.das@giz.de or read more [here](#).

Preview of the upcoming KUSUM monitoring portal under development. The data shown here is exemplary only.



Renewable Energy in Smart Cities – Rise of Solar Cities

25 March 2021 | Gujarat, India

The rapid urbanisation, changing lifestyle and economic development are increasing the demand for energy in Indian towns and cities. With rising urbanisation, the demand for modern fuels for cooking, lighting, transportation, cooling applications and more is set to increase. Given the continuing megatrend of urbanisation and the related energy demand in India, Renewable Energy including solar PV offers an excellent option of a climate-neutral source of energy that can be integrated into the urban space.

On request of the Ministry of New and Renewable Energy (MNRE), GIZ India under the project "Integration of Renewable Energies in the Indian Electricity System (I-RE)" has initiated and executed several technical studies, training and pilot project implementations in the field of renewable energy planning and framework design for the dissemination of renewable energies, specifically distributed grid-connected PV. The project is part of the International Climate Initiative (IKI) and was commissioned in December 2014 by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMU). Recently GIZ

in coordination with MNRE has agreed to provide support to the four City Nodal Agencies (CNA) of Dwarka, Gandhinagar, Ayodhya and Amritsar for transforming the cities to 100% renewable energy cities. Under this project, GIZ plans to undertake the following activities:

1. City-level energy plans: Development of a detailed cross-sectoral city level energy action plan which would assist the city to follow a cleaner and greener pathway, to reduce greenhouse gases (GHG) and make use of climate related benefits while achieving other development goals.
2. Roadmap for 100% Renewable Electricity: To develop a roadmap on how each of the four cities can meet their electricity needs with 100% Renewable Energy (RE).
3. Potential Assessment of distributed solar PV applications: To assess the technical potential of distributed solar PV systems across the cities that can be installed on sites within or near the city limits, across all the categories of consumers including

PV Port System
installed in Gujarat.

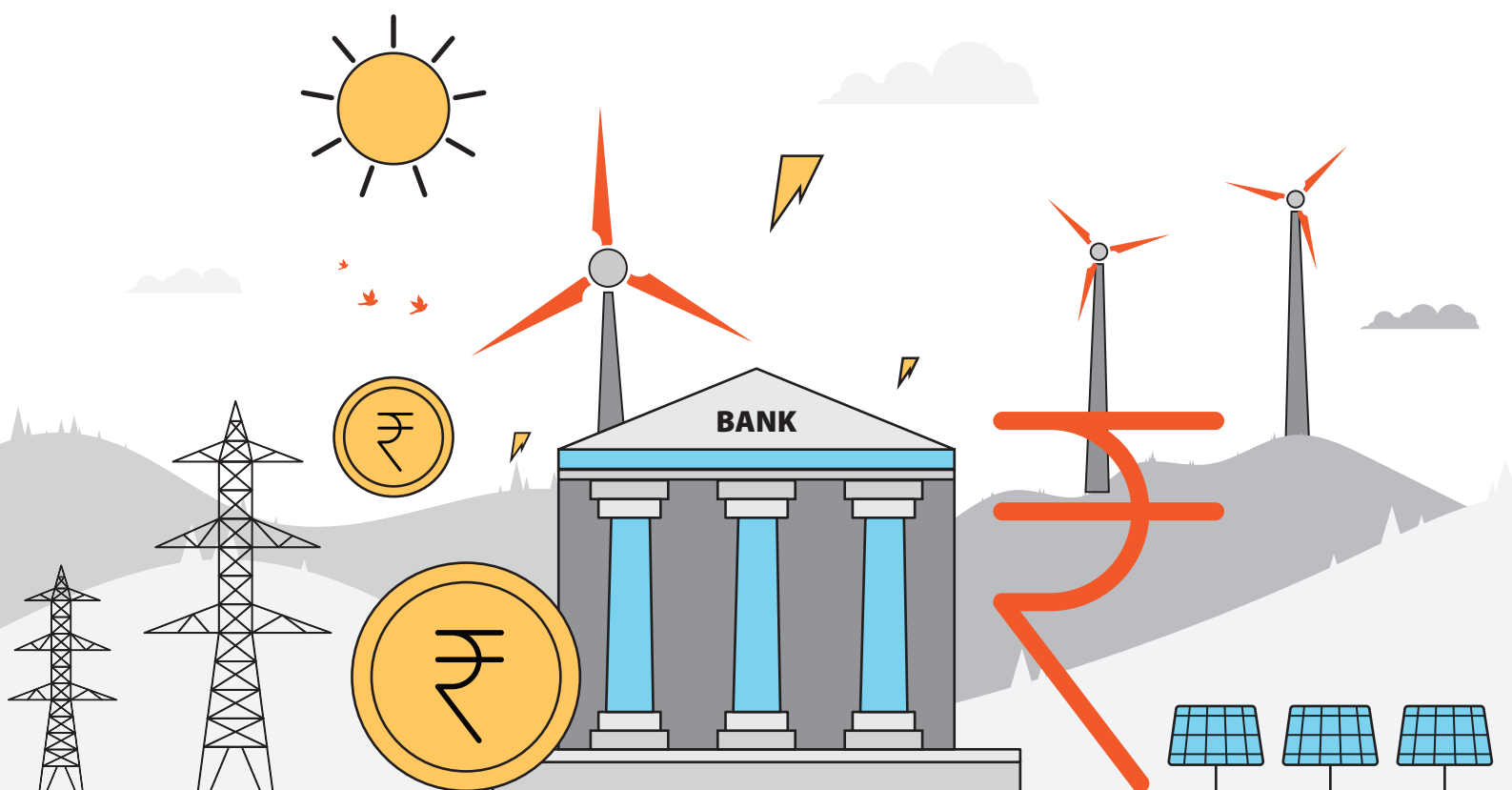


residential, commercial, industrial, public and governmental buildings/spaces. The estimation will not be restricted to PV on rooftops but will also include PV systems on parking areas, open spaces, water bodies, warehouses, agricultural lands (vertical PV) and other accessible/alternative innovative areas for PV deployment.

4. Demand Aggregation for distributed solar PV Systems: The collection and aggregation of demand for distributed solar PV which includes marketing, demand promotion and more, from prospective consumers for installation of solar PV systems is an important step to reduce the transaction costs during the project implementation.

5. Development of a web-based Dashboard: Development of a national web-based dashboard to monitor and analyse the current status of the 100% RE initiative and to show further potential for increasing the share of RE. The dashboard will provide comprehensive information on relevant parameters and will act as a one stop source of information for relevant stakeholders.

For further information, please reach out to Joerg.Gaebler@giz.de or Kuldeep.Sharma@giz.de.





Moving from kW to kWh: Ensuring Increased Electricity Generation through Improved Solar Rooftop PV Quality

April 2021 | New Delhi, India

The Government of India has set an ambitious target of achieving 100 GW of solar installations by 2022, of which 40 GW is earmarked for rooftop solar. While the current approach towards this goal has been to substantially increase the installed capacity (kWp) of rooftop PV systems. It is important to ensure that these rooftop solar systems perform optimally with high specific yields (kWh per kWp). Understanding this need to address concerns regarding the quality of rooftop PV installations, GIZ undertook the “kW to kWh” technical study to conduct a quality evaluation of selected rooftop solar PV systems across India.

The kW to kWh study involved the on-site analysis of 40 rooftop PV plants of various capacities along with analysis of the contracts, warranties, and O&M practices. It involved consumer segments such as government, educational, residential, and commercial rooftop PV plants, including both, subsidised and non-subsidised PV plants. The analysis majorly included activities such as visual inspection of the plants, soiling factor estimation, I-V curve tracing, infrared imaging, electroluminescence

tests, contract & documentation review, interviews with the EPC, O&M contractor and site owners. Building on the success of this study, GIZ is currently extending the analysis to additional 60 sites across 9 states in India. It will now include causes for cell cracking by analysing aspects related to the logistics of PV modules and mounting structures.

It is no secret that the results from the study have highlighted significant shortcomings in installation and maintenance practices for rooftop PV systems such as mechanical damages in PV cells, soiling, improper plant design, and construction among other things which were present in a significant number of plants, as seen in figure 1. Issues such as the soiling of modules caused an estimated loss in the generation of up to 19% in some PV plants. Additionally, sub-par operation and maintenance of these rooftop PV plants was another aspect that contributed to a significant loss in energy generated, due to poor practices and lack of proper warranty and replacement mechanisms in place for damaged components (figure 2).

Figure 1:
Common findings in
all 40 sites.

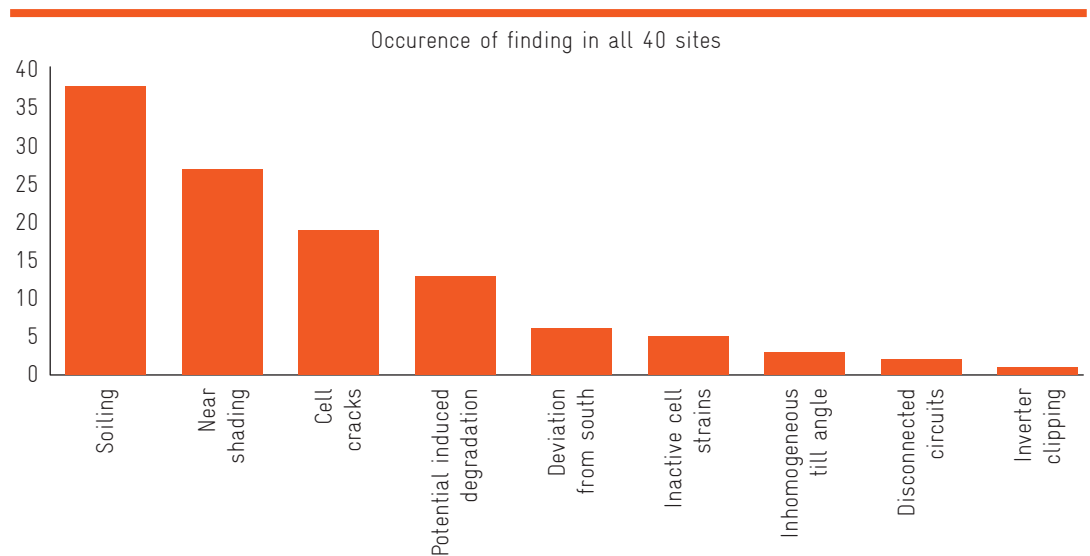
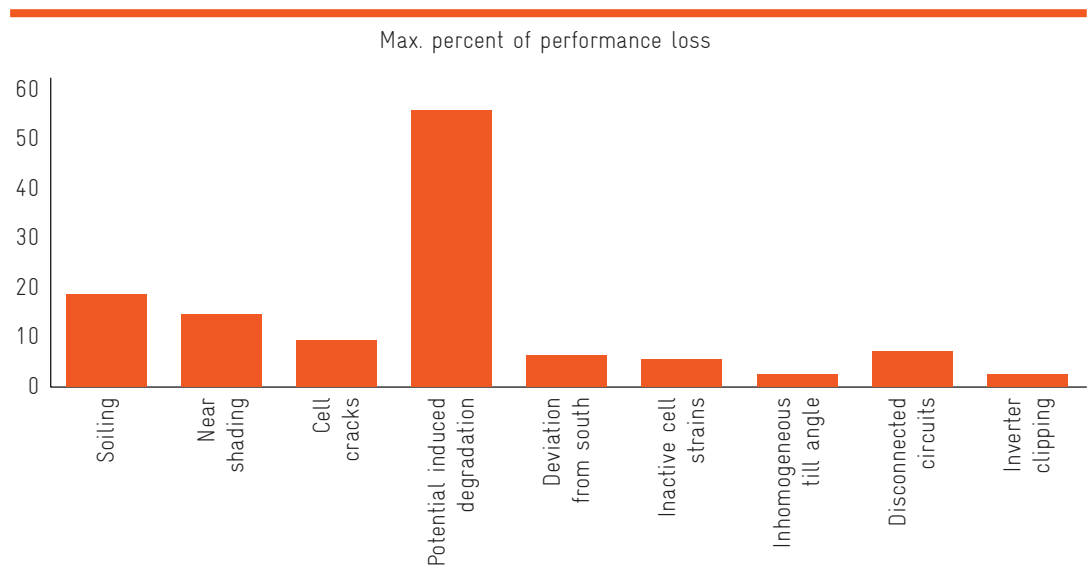


Figure 2:
Percentage of
performance loss.

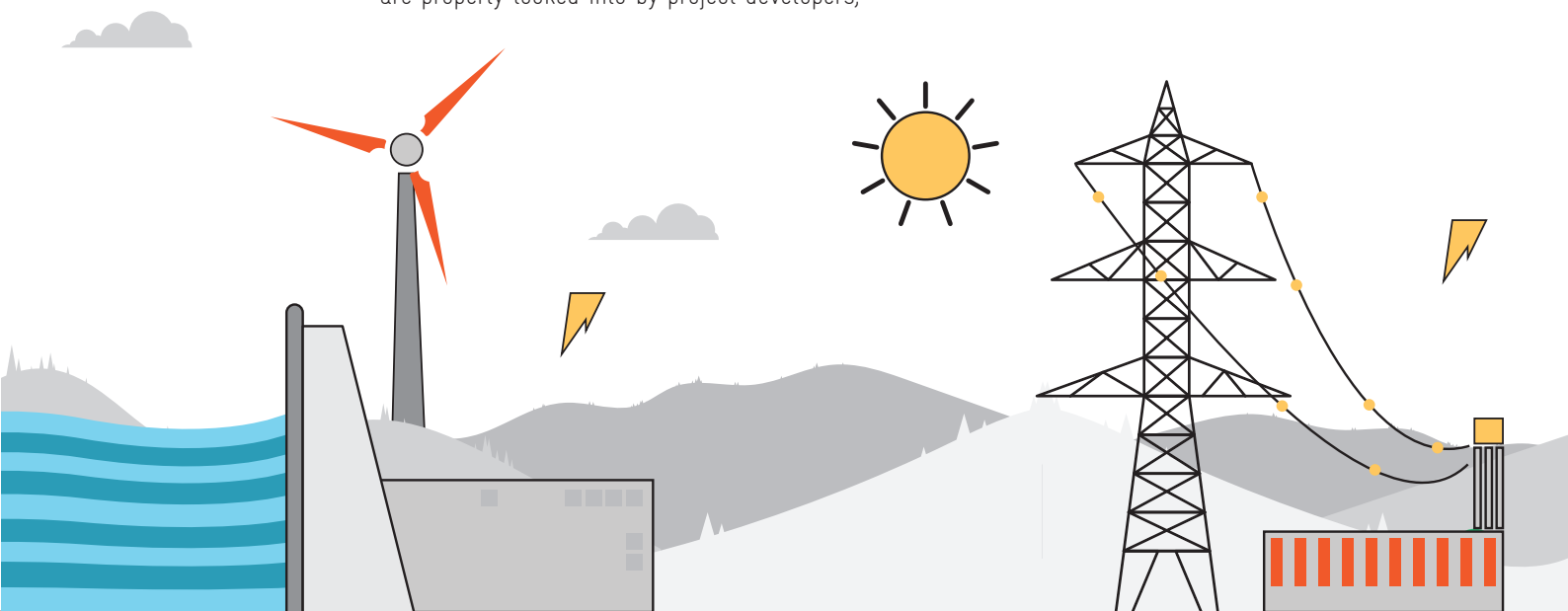


Based on the findings, five major retrofitting actions were suggested: (i) Re-sorting of modules and strings for better performance, (ii) Increasing the modules cleaning frequency depending on the soiling factor, (iii) Replacement of damaged modules while still under warranty, (iv) Shortening of module strings to counter near shading, (v) Increasing the albedo factor of the surroundings.

EPC companies, DICSOMs, and owners to ensure the longevity of their rooftop PV plants, and to facilitate further uptake of rooftop solar in India by moving away from just capacity addition (kW) to ensuring optimum generation (kWh).

For more details on the kW to kWh technical study, kindly visit: <https://kwtokwh.in/>

It becomes imperative that all issues identified are properly looked into by project developers,



Performance Analysis of Large Scale Solar PV Plants: Study of MW to MWh

India is the third largest economy in the world and needs energy to fuel its growth. The way India chooses to meet its energy requirement has a large impact globally. However, India is among the few countries which is on the path to meet its NDC targets. Until 2030 the nation aims to have 300,000 MW of solar power capacity installed. So far more than 40,000 MW have been installed. To analyse whether the installed MW capacities are delivering the foreseen and required amount of electricity (megawatt hours), GIZ India carried out an analysis of large solar PV systems installed in the country.

To analyse the performance, the publicly available data of 44 solar generating stations from Central Electricity Authority (CEA) RE generation reports for the period of January to October 2020 were used. The data was segregated into two categories, government owned stations and privately owned stations. The spread of the generating stations across 15 different states is shown in figure 1.

3 states have been shortlisted. It was observed that the performance of government owned stations seemed to be fairly below the reference level with average monthly CUF between 13.4–19.87% and losing 3.1 MU of electricity every month in comparison to the designed capacity. Privately owned power stations seem to have been performing above this level with average CUF ranging 21.28–28.5% and gaining 105.3 MU of electricity every month as shown in figure 2.

One reason for such a variation in the generation of solar PV plants in government owned stations vs private stations was found to be the oversizing of DC solar capacity of plants. The oversizing recommended is generally 10% to achieve maximum power output from the installed system. It was observed that the government owned stations with the cumulative capacity of 594.92 MW were designed with a DC:AC ratio of around 1.1 which means the systems were oversized by 10% in DC capacity in comparison to rated AC capacity.

Figure 1:
Solar PV installations
(in MW)
across India
as per CEA data.

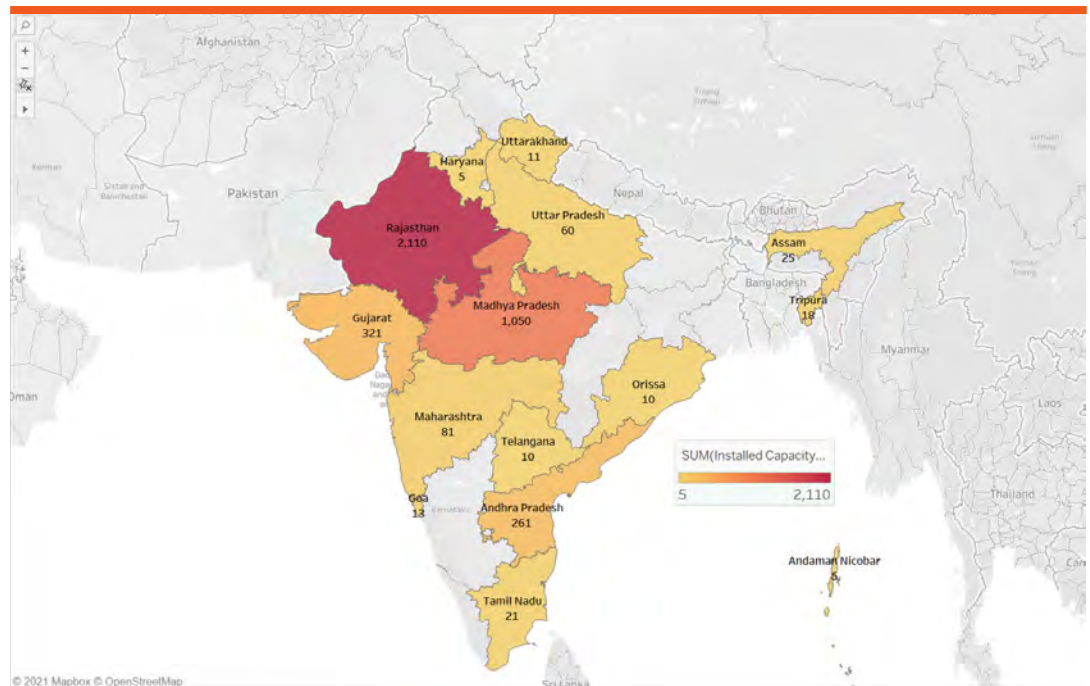
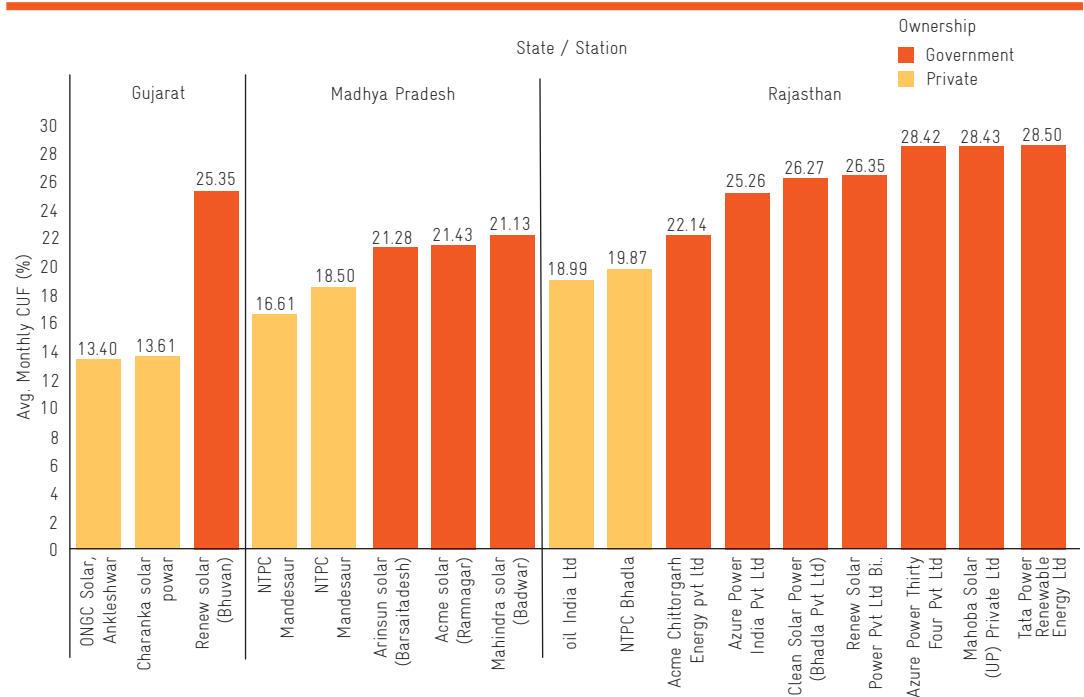


Figure 2:
Average Monthly CUF
(%) of shortlisted
Solar PV power
plants.



However, the privately owned stations with the cumulative capacity of 2480 MW seemed to significantly perform better due to the high over-loading ratio i.e. 1.2 in Madhya Pradesh, 1.4-1.5 in Rajasthan and 1.1 in Gujarat. The performance of the government, as well as private owned stations in Gujarat, were comparatively lowest across the three states. The lower performance for the government owned stations may be also caused by poor maintenance, plant outages or design issues.

The results indicate that private developers are oversizing the system DC capacity to generate additional units of electricity and are able to provide lower tariffs in competitive biddings. In the year 2020, the range of tariff that was discovered in the solar PV tender for the Rajasthan location was 2.00-2.01 INR/kWh, whereas for Gujarat it was 2.73-2.78 INR/kWh. The difference in tariff may be related to the overloading being practiced by developers at these locations, wherein the developers are able to generate more energy from the plant

at a lower cost. As per the latest CERC tariff regulation for renewable energy, the minimum CUF stated for solar PV plants is 21%. If the analysed government owned stations would add around 77 MW on the DC side, operation at 21% CUF could be achieved. Certainly, this would mean that the recommended oversizing factor needs to be increased in agreement with the competent authorities. As a result, by maintaining the AC infrastructure of the solar PV plants, the project owner will get the additional benefit from increased power generation. The true efficiency of a plant can certainly only be measured if the output power is related to the installed DC capacity. This data is mostly not available. Another approach to determine the efficiency of a solar plant and which does not require the information on the total DC capacity installed, is to relate the electricity generation (megawatt hours) with the square meter land covered by the entire plant or by the solar panels only. This could be easily done via satellite image analysis.

Duties in Solar

Climate change is a global threat to humankind/humanity caused by anthropogenic carbon dioxide emissions from burning of fossil fuels. At the same time, the economic development across the world is fuelled by energy, and it will continue to do so in the future. To continue the reliance on energy and to reduce carbon emissions at same time, in most regions the world will have to move to renewable sources of energy like solar and wind. Fortunately, solar and wind resources are available in abundance in most regions but the technology to capture them through windmills and solar panels is concentrated in certain countries only. To take advantage of this booming industry, countries like China created huge manufacturing facilities. At the same time countries like India, the US but also Europe and other countries are coming up with various measures to promote domestic manufacturing and protect their strategic interest in this sector. The solar team of GIZ India has carried out a short analysis on the global scenario for duties on solar panels and cells. The analysis provides insights into the strategies of different countries and may give indications for the future of trade and manufacturing. Various types of duties imposed are listed in table 1:

Different countries have strengthened their domestic manufacturing by imposing duties on the imported products over the years, and

have modified as per the scenario. A brief representation of the import duty timeline by different countries like India, USA and Europe has been shown in the figures 1 to 3.

India has also taken steps over the years to support its solar domestic manufacturing. It imposed its first safeguard duty on the solar PV cells and modules in 2017 which was later put on hold by the court. In 2018, it implemented a safeguard duty for a period of 2 years on the import of solar PV cells and modules from countries like China, Malaysia and Taiwan. Recently, the Government of India has decided to replace its safeguard duty with the basic custom duty starting from April 2022, in order to boost domestic manufacturing by making the imported products costlier.

The USA and Europe have imposed anti-dumping duties as well as countervailing duties on imports to nullify the subsidy & dumping of Chinese solar cells and modules. This led to a decrease in the share of imported modules in the market, but after a while, it was observed that the share of modules imported from Taiwan and Malaysia started increasing and it led to extending the duties to these countries as well. While the US authority announced safeguard duty for a period of 4 years and imposed additional import duty on Chinese PV cells and modules, the European Commission negotiated to

Table 1:
Type of Duties

Basic Custom Duty (BCD)	BCD is a duty or tax imposed under the customs act on the import of products. They vary from 5-40% for different items as notified.
Safeguard Duty	They are provided temporarily to protect the domestic industry when there is a sudden increase in the import of a particular product and can be applied only after the investigation of competent authority.
Anti-Dumping Duty	These are applied on a particular product when the government believes that an import of a product from a foreign country is priced below the fair market value and the product is being dumped in the domestic market through low pricing.
Countervailing Duty	Countervailing duty or anti-subsidy duty are applied on the import to counterbalance the effect of subsidy provided by the importing country in their domestic market to reduce the price.

Figure 1:
Representation of the
import duty timeline
by India.

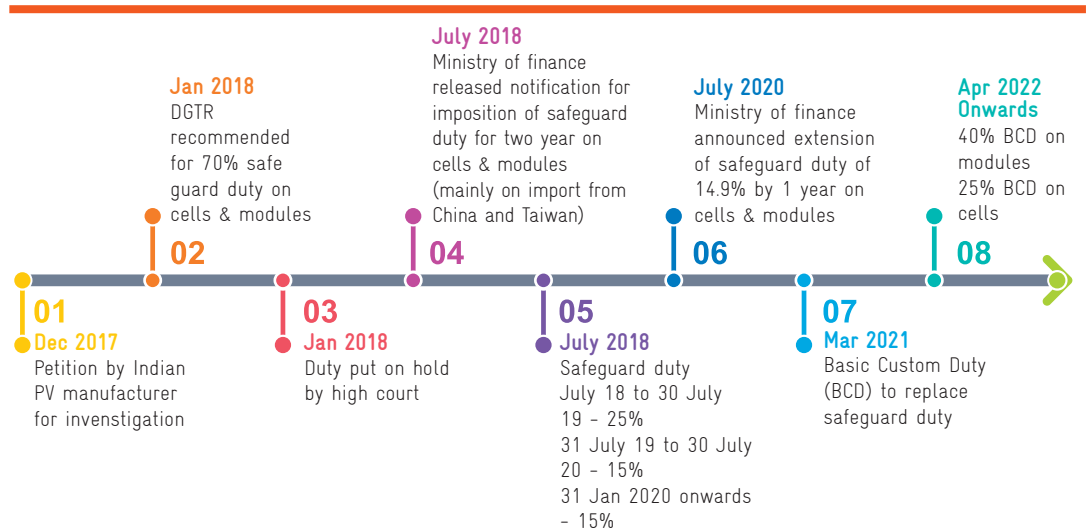


Figure 2:
Representation of the
import duty timeline
by USA.

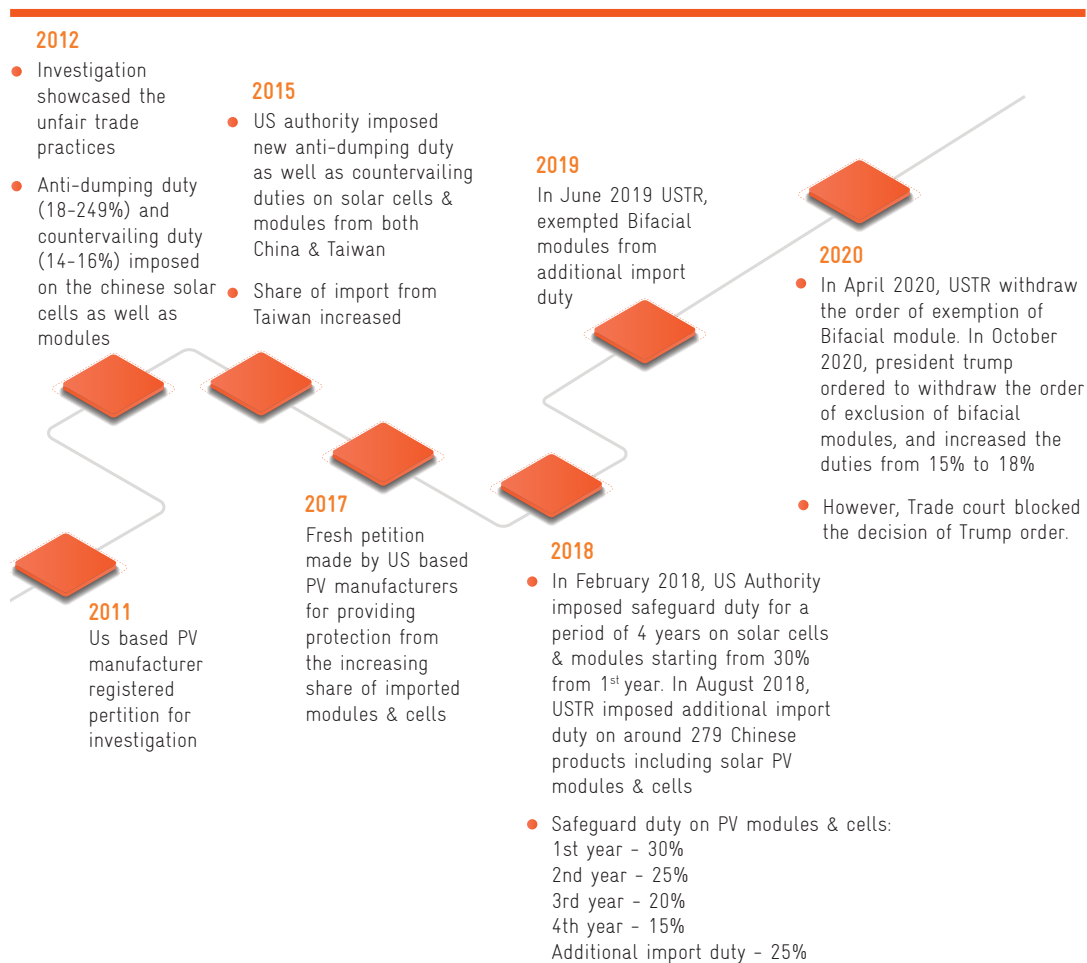
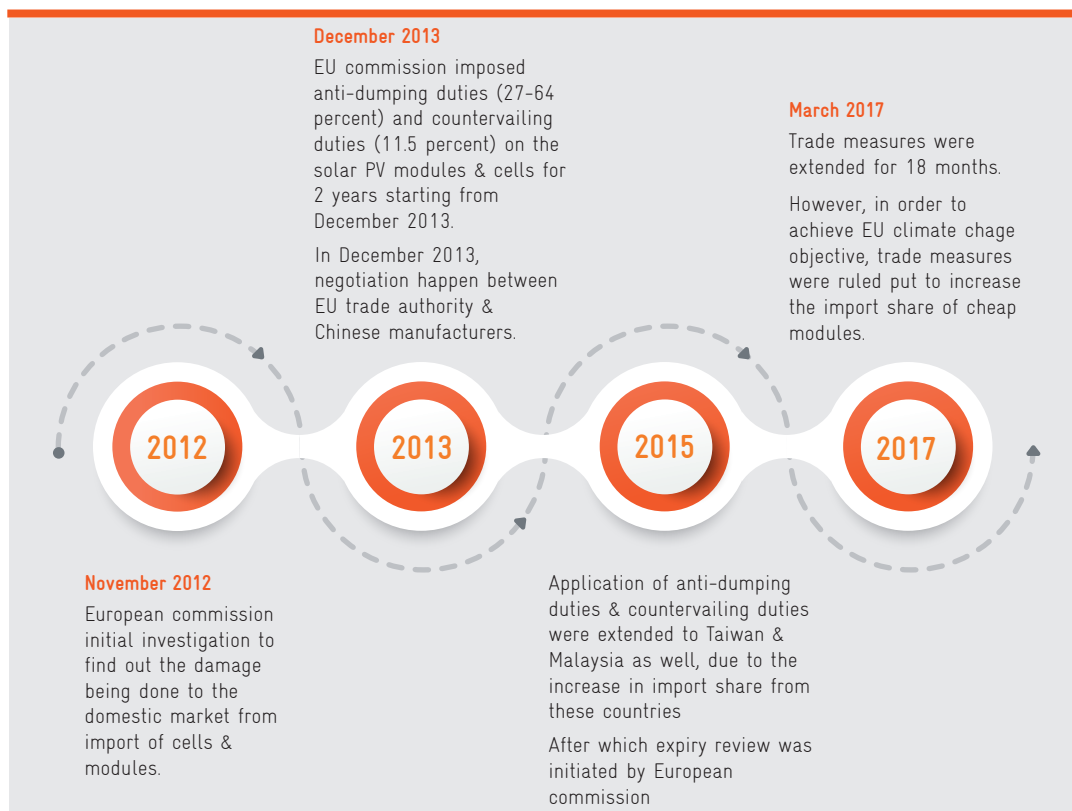


Figure 3:
Representation of the
import duty timeline
by Europe.



exempt the Chinese products from the duties on the condition of selling them above the minimum import price (MIP). However, for achieving the EU climate change objective the trade measures were ruled out to increase the penetration of cheap imported modules in the market to upscale the solar PV deployment.

Similar to Europe, Brazil has announced to remove the import duty on certain types of modules, inverters and trackers in order to reduce the revenue loss to the state. Turkey has shifted to a new formula for calculating import duty on solar PV modules. In April 2020,

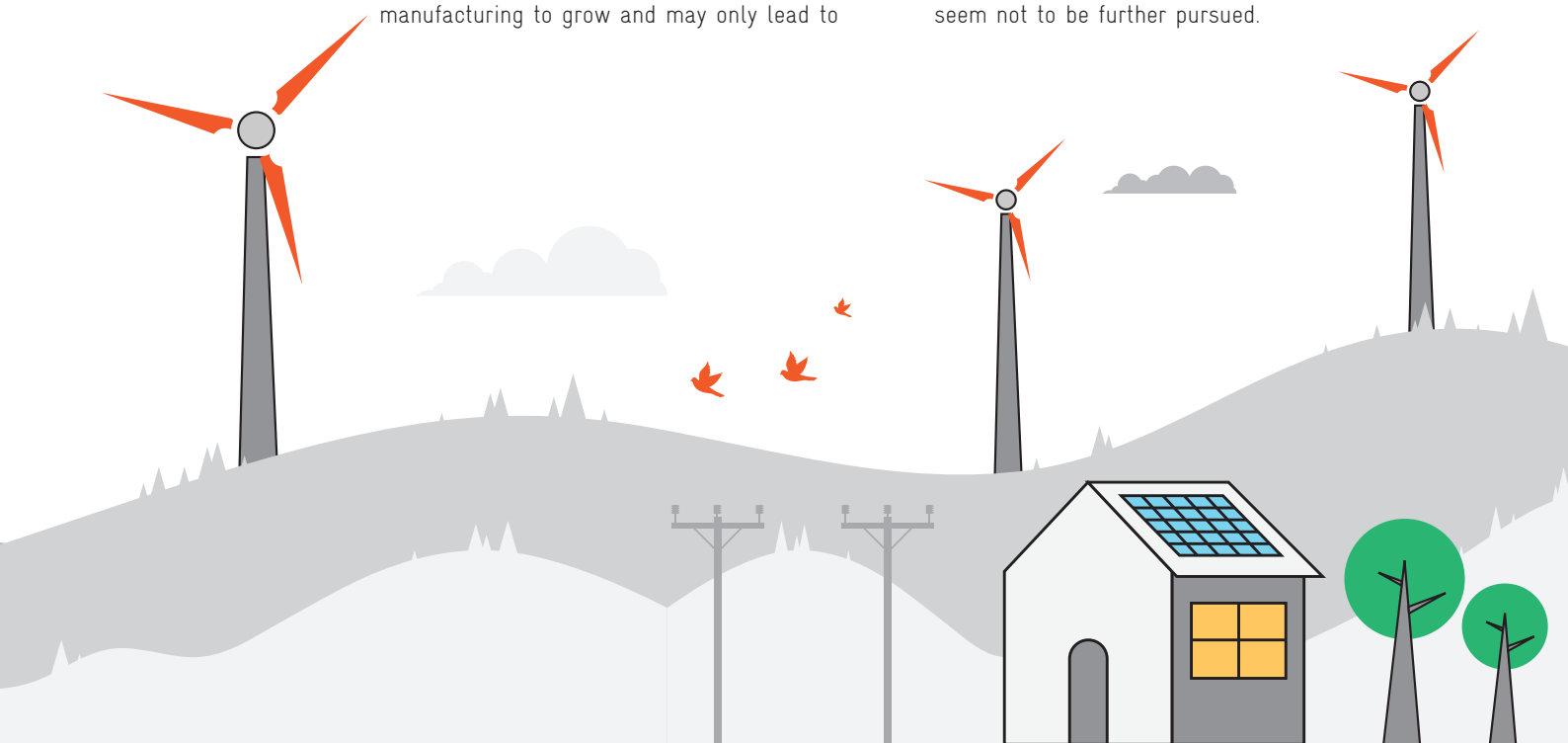
it had announced to consider kilograms as a measurable unit for calculating import duty instead of per square meter. The adoption of new formulas can be related to the increase in weight of the higher efficiency modules. It has been found that there is a difference of around 3 kg weight in the higher efficiency modules, and the new formula is expected to be more effective in discouraging the import of solar modules. Based on the overview done for different countries, a comprehensive representation of the current import duty applicable on Solar PV module & cells by different countries has been prepared and represented in table 2.

Table 2:
Import Duty on
Solar PV Cells
& Modules.

Latin America (including Mexico)	BCD: 2 to 5% ; Import Tax: 1 to 3% (Modules manufactured or assembled in USA are exempted from duty in Mexico)
Middle East (Dubai)	VAT (or BCD): 5%
Australia	BCD: 1% (No duty imposed for China)
Cambodia	BCD: 5.5% (on modules) No duty imposed for modules manufactured in Vietnam.
Malaysia	BCD: 2 to 5% (No duty imposed for China)
Korea & Japan	BCD: 8 to 10%
Uganda & Zambia	BCD: 2% (Products assembled in Zambia are exempted from duty)
South Africa	BCD: 5%
USA	BCD: 1% For China (Module or any raw material): 13–15%
Europe	BCD: 0%

Countries like Brazil and Europe are shifting away or have already removed the duties on solar PV products majorly on modules and cells. It is feared that changing trade measures bring uncertainty among the developers and would finally result in a reduction in the pace of solar PV deployment. Many countries seem to be convinced that protective measures are not the optimal long term solution for domestic manufacturing to grow and may only lead to

trade conflicts. Amongst other measures, China has been able to reduce its prices due to the supportive subsidies that were being made available for the manufacturers. It has been found most effective to provide supportive subsidies to the domestic manufacturers to become competitive. As Europe, which is kickstarting new PV manufacturing capacities, measures to protect themselves from imports seem not to be further pursued.



A Digital Initiative - Adapting to the New Normal

October 2020 | Virtual

In view of the on-going pandemic where uncertainties are high, a new approach was undertaken to support companies that struggle to maintain their energy management needs. In general, except for large industries, companies depend on energy auditors to identify areas of improvement and suggestive measures to overcome gaps. Audits play an essential role as they monitor and track process improvements within companies. But due to the pandemic and lack of physical presence, audits were not conducted in most of the companies. To avoid any lag in process efficiency in these challenging times, the following programme was implemented.

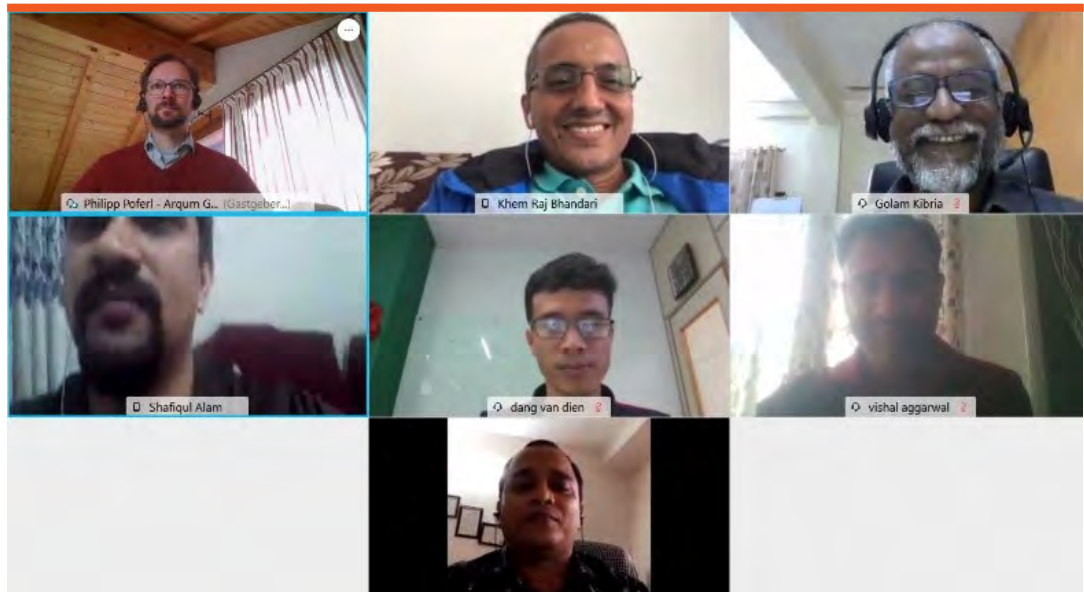
The GIZ internal sector network TUEWAS (Transport, Environment, Energy and Water in Asia) which aims to promote regional cooperation and exchange, developed the project of "Introducing a facility in-house mechanism to trigger energy efficiency behaviour among industrial consumers through online support to increase the productivity and mitigate carbon emission".

The focus of this initiative was on establishing digital small energy efficiency groups (DSEEG) in

Vietnam, Bangladesh, India and Nepal. Inhouse teams or as we call them digital small energy efficiency groups (DSEEG) were established within selected companies to strengthen the energy management, to develop energy efficiency knowledge and improve the capacity of energy relevant personnel as the basis for continuous improvement process in the companies. This was implemented by online coaching of the DSEEGs to improve their technical and financial energy efficiency project appraisal as well proposal preparation and presentation skills.

In each of the four participating countries, three companies were selected by the staff of the GIZ within the country. For each country project, one national energy efficiency consultant (NC) was contracted to bridge the communication gap between the international consultant (IC). NC's played an important role in the entire activity as they joined online trainings and conducted the onsite visits and walk-through audits. These visits included technical support for the DSEEGs in establishing facility energy efficiency action plans (FEEAPs).

Online Training of NC's National Consultants.



The IC supported the whole DSEEG program by developing the training content, training and fostering an experience exchange with the NCs.

The results of this project were impacting:

Projected Overall Investment [\$]	Potential Yearly Saving		
	[kWh]	[\$]	[t CO2]
\$803.609	5.366.040	327.107	3.904

With an overall potential investment of \$803.609 yearly savings of more than 5 GWh, more than 3.900 t of CO2 and more than \$300.000 can be achieved. As it was not possible to calculate CO2 savings for all measures the actual saving potential would be even higher.

The program succeeded in initiating processes in the companies with regard to energy efficiency, development of a large catalogue of measures, capacity building and thus strengthening energy management. The prime objective of establishing digital small energy efficiency groups (DSEEG) in

all the selected companies to carry out energy management was achieved. In spite of the short duration of the project, this remains an ongoing practice in these companies.

A digital initiative implemented to meet the energy efficiency needs in these challenging times turned out to be a successful model which can be easily replicated and opened the doors for future partnerships.

For more details, please contact Mr. Nitin Jain nitin.jain@giz.de

On-site Industry Visit (India).



High-Performance Metallic Materials for Energy Storage (MATAPP-2021)

22-23 April 2021 | Virtual

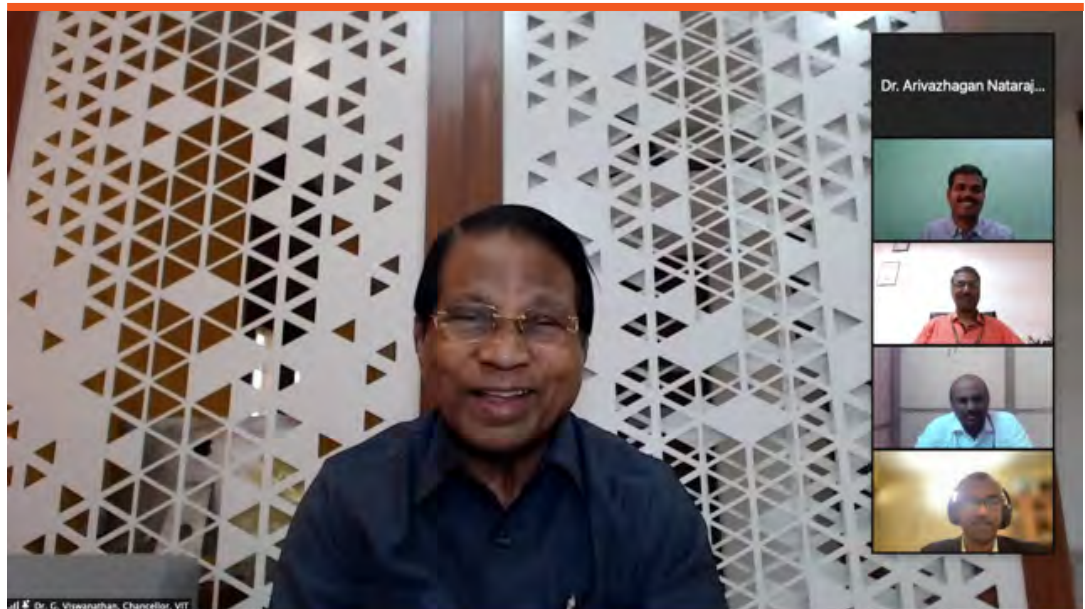
Indo-German bilateral workshop on high-performance metallic materials for energy storage and power generation (MATAPP-2021) supported by IGSTC was jointly organised by the Vellore Institute of Technology (VIT) & FZ Jülich on 22-23 April 2021. The workshop coordinators were Dr. M. Manikandan, VIT and Dr. Bernd Kuhn, FZ Julich GmbH.

While worldwide fossil fuel based power plants are being phased out, some avenues are still being explored in India to increase the efficiency of thermal power plants and reduce emissions. The development of advanced ultra-supercritical power plant technologies is being handled on mission mode in the country. In this context, speciality steels and superalloys are being

developed and evaluated. On the other hand, solar power generation has become the most important type of renewable energy in India. Here again, Concentrated Solar Power (CSP) based power generation has several advantages. Thermal energy storage systems become important in this context and special steels and superalloys resistant to Phase Change Materials (PCM) need to be developed. The workshop covered special metallic materials required for advanced versions of thermal power plants and energy storage systems for CSP technology.

For more details, please contact Dr. M. Manikandan, manikandan.manoharan@vit.ac.in and Dr. Bernd Kuhn, b.kuhn@fz-juelich.de.

Dr. G. Viswanathan,
Chancellor,
VIT delivering
Presidential Address.



4

Quote of the Month from India and Germany

Quote of the Month from India



Mr. Amitabh Kant,
CEO, NITI Aayog



Green Hydrogen is key to reducing imports of energy, achieving deep decarbonisation of energy, chemicals & transport sectors. Refining, ammonia & steel are key pillars around which the green hydrogen can be scaled up.”

Quote of the Month from Germany



Mr. Peter Altmaier,
Hon'ble Federal Minister for
Economic Affairs and Energy, Govt.
of Germany



Solar energy plays a central role in the success of a global sustainable energy transition. Only together with international partners and in strong international organisations can we advance the global energy transition and shape it sustainably. Germany is ready to contribute to the work of the International Solar Alliance with all its might.”

5

Energy Transition News

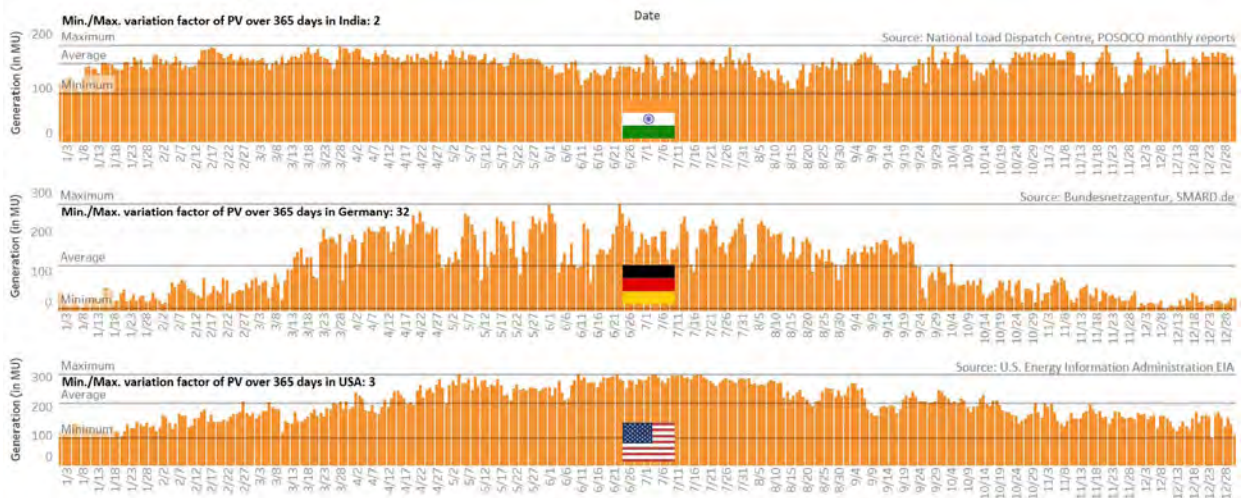
A Peek into Energy Dashboards in India

India has set itself ambitious renewable energy targets and Honourable Prime Minister Modi recently called for a “decade of climate action”. Until 2030, the country plans to reduce its coal share in the generation capacity mix to less than 40% and install 450 GW capacity of renewables. Yet, India still heavily relies on fossil energy sources, with coal making up roughly ¾ of the country’s total electricity generation today. To be able to understand to which extent India can fully rely on renewable energy sources, access to high-quality, accessible, and intelligible data is key. Data, especially in the form of comprehensive dashboards, is not only crucial from a planning and investment perspective but ideally contributes to an informed public debate about energy policies. One example: Looking into 365 days of solar photovoltaic (PV) generation in India in the year 2020, one easily can notice that India with such a high solar energy security level can technically fully rely on solar. The difference between the record day generation and the lowest solar generation is one of the lowest on earth.

In this context, IGEF has screened the landscape of electricity generation dashboards in India, with a focus on available and well visualised renewable energy data. A central outcome so far is that a number of promising dashboards already exist. Two examples are presented in the following.

The [Vasudha Power Info Hub](#) is found to be the most comprehensive dashboard focused on power generation in India currently available. Launched only in May 2021 and managed by the Vasudha Foundation, an environmental NGO founded in 2010, the declared mission of the Info Hub is to provide a “one of its kind resource platform” to stakeholders, investors and policy makers to inform India’s transition away from coal. The dashboard is well-designed, follows a clear concept and compiles fine-grained data on all major energy sources, ranging from daily generation data and installed capacity, to tariff trends and plant location. It even compares individual states with one another, for instance in terms of their total renewables generation, with Karnataka taking first place, followed by Tamil Nadu and Gujarat.

Another notable dashboard is the [Energy Analytics Lab](#), run by the Indian Institute of Technology (IIT) Kanpur and funded by the Indian Energy Exchange (IEX). Even though it does not strictly focus on renewables data, the platform combines three ambitious dashboards for power system, power market and power balance into one platform with the declared goal to “enable stakeholders to understand various aspects related to power markets and take informed decisions”. The system dashboard for instance offers real-time demand, exchange and price data on regional and state level, while the



power market dashboard displays information on IEX's Day-Ahead Market trading prices for electricity.

Besides these two, there are a number of other noteworthy dashboards including www.renewablesindia.in from the Central Electricity Authority (CEA) in collaboration with the Council on Energy, Environment and Water (CEEW) or the dashboard recently launched by the government's think tank NITI Aayog. Visualisation of real time generation data can be accessed via the Merit India portal offered by the Ministry of Power <http://meritindia.in/> or at <https://carbontracker.in/> by the Centre for Social and

Economic Progress (CSEP) using the same data. Wind and solar generation is clubbed under renewables here which does not allow to analyse solar or wind generation separately. The *Prayas Pune* is providing a nice annual overview. CEEW's *Centre for Energy Finance* is providing generation data on a monthly level. The International Energy Agency displays its data on India *Country Profile of India*.

All dashboards are only possible because the Government of India through POSOCO and CEA has decided to make existing data available. IGEF is looking forward to future developments in the field of energy dashboards in India.



Can “district cooling” learn from “district heating”?

This is what it's all about: More green district heating or cooling to cut carbon emissions.

Homes are a good place to start, given that heating homes and offices, commercial and industrial buildings in Germany accounts for more than half of the overall energy consumption of the country. More green district heating can help cut emissions and mitigate climate change. But what exactly is district heating? And how can we make sure there will be more of it in the future?

District heating is the term used to designate the supply of heat to buildings through a heating network delivering thermal energy. A power

plant, solar thermal or geothermal installation or a large heat pump is used to heat water which is then fed into a network of insulated (and usually buried) pipes, straight into the buildings connected to the system. The water then flows through a handover station and into the building's own heat distribution system, which provides for a supply of heating energy and hot water. Once the water has cooled down, it flows back to the original heat source and the circle begins anew. In other words, buildings that are supplied with district heating can do without their own heating systems and chimneys.

District Cooling
System. ©Plamen
Galabov/
Shutterstock.com



District heating networks to make the switchover to renewables and waste heat

The energy transition in the heating sector is a prerequisite for the success of the wider energy transition. District heating is a key element of the energy transition in the heating sector. The existing district heating networks need to be decarbonised, i.e. switched to lower temperatures and fed with renewables or waste heat. By contrast, our existing district heating networks usually work with temperatures of 95° C or more. And they are most commonly powered by power plants that do use **combined heat and power (CHP)** but are based on fossil fuels. In fact, more than 70% of district heating still came from natural gas, lignite, or hard coal in 2020. So the share of renewables needs to increase.

By 2050 at the latest, even natural gas will no longer be permissible as a source of heat for the heating networks in Germany. There are different technologies available, including large heat pumps or solar thermal installations, geothermal installations, and CHP installations based on biomass or green hydrogen. Since 2010, the share of renewables in district heating has steadily risen by around 10% from the initial 7.8%. In 2020, 17.8% of the 126 billion kilowatt hours (kWh) of district heat generated in Germany came from renewables (more than 22 billion kWh). This is what the initial analysis of the data on district heating in Germany in 2020 shows.

For urban areas, green district heating is a way forward towards better climate action

Today, district heating makes up only a small share of the heat we use. In 2018, some 109 terawatt hours of heat were supplied from heating networks. This is around 8% of the overall need for heating for buildings and for process heat. In the future, district heating will have to be used to supply a much greater share of buildings. This is because heating networks are extremely useful in the transformation of the heat supply: unlike individual buildings, they can be powered with a large range of different renewable and climate-neutral heat sources, better incorporate heat storage, and even store heat themselves. That said, district heating is not a solution that works efficiently everywhere. The need for investment is comparatively high,

and even if the pipes are very well insulated, they will lose some of the heat over longer distances. This means that district heating so far only works for densely populated areas.

“Green district heating is an opportunity for climate action, particularly in densely populated areas like cities where there is often no space for on-site renewables installations”, says Kerstin Andreae, managing director of the German Association of Energy and Water Industries (BDEW). In the years to come, the operators of local district heating networks are planning to make large investments in the switchover of district heating to renewable sources of heat and to waste heat.

Dialogue on climate-neutral heat and the right policy framework for this

It is important to get the policy framework right for these developments to take place. This is why, in February 2021, the Federal Ministry for Economic Affairs and Energy launched a **dialogue on ‘climate-neutral heat’ (in German only)**, bringing together the stakeholders involved in the heat market for discussions on how to pave the way towards a climate-neutral heat supply by 2050. What can the Federal

Government do to speed up this process? What should be the design for planning processes for a climate-neutral heat supply at the municipal, states, and federal levels? How can decision-makers from different sectors be brought together? To read the brochure on this “dialogue on climate neutral heat”, please click [here](#) (in German only).

6

Publications



Renewable Capacity Statistics 2021

The International Renewable Energy Agency (IRENA) produces comprehensive statistics on a range of topics related to renewable energy. This publication presents renewable power generation capacity statistics for the past decade (2011-2020) in trilingual tables.

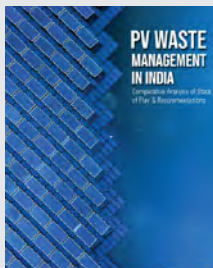
The full report is available for download [here](#).



Agrisolar Best Practices Guidelines by Solar Power Europe

SolarPower Europe has developed the Agrisolar Best Practices Guidelines as a continuation of their Agrisolar briefing released in 2020. These new guidelines focus on establishing standards and best practices for different Agrisolar business models in Europe, in order to build trust and create a dialogue with policymakers, support the harmonisation of national frameworks, and advise local and international actors on how to successfully develop Agrisolar projects.

The guidelines can be downloaded [here](#).



PV Waste Management in India

In cooperation with the National Solar Energy Federation of India (NSEFI), PV CYCLE, and the EU-India Technical Cooperation Programme - Energy (PV Rooftop Cell), SolarPower Europe co-authored a new report on PV Waste Management in India. This study analyses the current state of play of solar PV waste management in India and gives recommendations for how to enhance the policy framework around this topic.

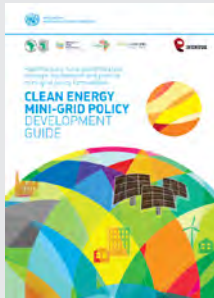
The full report is available for download [here](#).



Engineering, Procurement & Construction Best Practice Guidelines Version 1.0

This document systematically goes through the Engineering, Procurement, Construction and Commissioning (EPC) phases of a solar power plant. It is assumed that quality is something that goes through the entire process, and the earlier it is introduced in the process, the lower the overall system build and O&M costs. The links between the "E", "P" and "C" stages, as well as the links between Development and EPC, and between EPC and O&M are described in detail to minimise handover problems, which increase costs at later stages and provide suitable risk management tools.

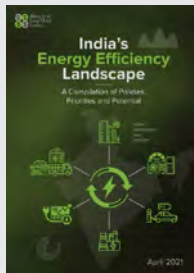
The full report is available for download [here](#).



Clean Energy Mini-Grid Policy Development Guide

The guide provides an overview of the most important aspects of mini-grid policy, with the aim of supporting policy makers to accelerate mini-grid deployment and enable national debates and decision making. Based on key lessons learnt from existing mini-grid policies and regulations, the guide presents a decision tree designed for policymakers to guide them through the decision making process.

The full report is available for download [here](#).



India's Energy Efficiency Landscape

This India Energy Efficiency report is a consolidated document that puts together all the information on energy efficiency programs carried out by the Bureau of Energy Efficiency, key government agencies on the state and central level such as EESL as well as by major bilateral and multilateral agencies.

The full report is available for download [here](#).



Global Wind Report 2021

In this special edition of GWEC's 16th annual flagship report ahead of the crucial COP26 conference in November 2021, the Global Wind Report 2021 highlights wind power's role on the road to net zero.

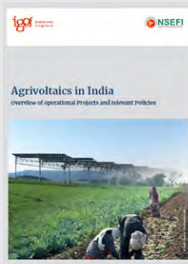
The full report is available for download [here](#).



2021 SOLAR PLUS ENERGY STORAGE

This report compares the cost of supply from the grid, partial supply from solar and partial supply from solar plus energy storage (lithium-ion) on the consumer side of the service connection (behind-the-meter) for selected HT consumer types in Tamil Nadu.

The full report is available for download [here](#).



Updated NSEFI report with all new Agrivoltaic plants in India

The updated version 2.1 of the NSEFI report is from April 2021 and contains all new plants and more fotos. Download the report "Agrivoltaics in India: Overview of operational Projects and relevant Policies" [here](#).



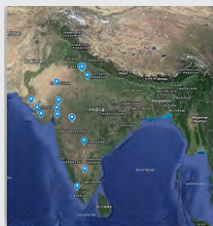
New German Agrivoltaics Norm DIN SPEC 91434 now also in English

The German Institute for Standardisation (Deutsches Institut für Normung e.V) has published the DIN SPEC 91434, a standard document to enable standardisation of criterion and terms in the Agrivoltaic sector as the basis for funding decisions. The document "DIN SPEC 91434:2021-05 Agri-photovoltaic systems – Requirements for primary agricultural use" can be downloaded free of cost from the following [website](#) in English. Simply register with your name and institute at the checkout.



Agrivoltaics: A Guideline for Germany

The publication gives an insight into the latest technological as well as legal framework developments. It can be downloaded [here](#).



Map by NSEFI and IGEF with all Agrivoltaic Projects in India

Check out the 16 agrivoltaic projects across India. Using satellite imaging, each project site can be viewed as well as its surrounding terrain. Clicking on the plant icon will give you more information about each plant. To visit the map click [here](#).



Digital Library on Green Mobility

This is the Digital Library on Green Mobility (DLGM) portal for Low Carbon Transport, especially Electric mobility, in India. The DLGM aims to provide a platform for sharing ideas, knowledge, and draft documents among the different stakeholders of various organisations and institutions from India and abroad involved in Low Carbon Transport in India. The portal aims at educating the researchers, academicians, citizens and businesses with access to information such as policy instruments, reports, articles, books, standards, case study etc.

To visit the website please click [here](#).

7

Upcoming Events

8th ESS Meet-Virtual Conference

7 July 2021 | Virtual

IESA is organising the 8th ESSMEET (Energy Storage Solutions Meet) conference on 7 July 2021 from 2.00 to 6.00 pm. This will be the largest virtual meet for C&I users to address four major issues:



- Solving power quality and reliability issues to avoid revenue loss due to interrupted manufacturing
- Reducing diesel consumption, by adopting Advanced Energy Storage as a back-up
- Developing Rooftop Solar + Energy Storage to supply evening peak power
- Energy cost savings through open access & energy storage

For further information please click [here](#).

Knowledge Session on Large Scale Green Hydrogen Production

14 July 2021 | Virtual

Indo-German Chamber of Commerce in collaboration with the Indo-German Energy Forum is organising a virtual knowledge session on "Large Scale Green Hydrogen Production" on Wednesday 14th July 2021, 13:00-15:00 IST with insights into ongoing international projects.



For more information kindly get in touch with Ms. Sumati Sud (sumati@indo-german.com) or register [here](#).

Atmanirbhar Bharat – Opportunities in Renewable Energy Sector

15 - 16 July 2021 | Virtual

Confederation of Indian Industry (CII) is organising a digital Conference & Exhibition on "Atmanirbhar Bharat" – Opportunities in Renewable Energy Sector a 2-day virtual exhibition (15-16 July) and 1-day conference (15th July) focussing on implementation of Renewable manufacturing facilities thereby enabling the transition to next level of manufacturing.



Large/Medium/Small-scale manufacturers, PSUs, Automation Experts, Service and solution providers, Government Officials, Bankers and Industry thought leaders are expected to be on board and share their valuable expertise and insights from this platform.

Click [here](#) to register. More information can be found [here](#).

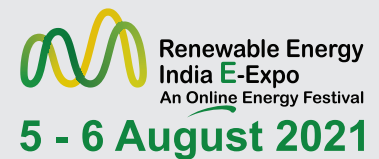
Renewable Energy India E-Expo

5 - 6 August 2021 | Virtual

On 5 - 6 August 2021, the 3rd Edition of Renewable Energy India E-Expo will virtually take place. As last time there will be a virtual exhibition as well as an e-conference. One of the sessions will be hosted by IGEF-SO.

The conference will cover a variety of subjects and topics which is the need of the hour and will evaluate the future.

The virtual trade fair will be free of cost for visitors. For more information and registration please click [here](#).



Renewable Energy India Expo

15 - 17 September 2021 | Greater Noida, India

The 14th edition of REI Expo will take place at India Expo Center in Greater Noida from 15 to 17 September 2021.

Both the exhibition and the conference provide an excellent opportunity to exchange ideas and technologies, gain insights into current global trends and get connected at networking events. Last year's event attracted more than 35,000 visitors, 700 exhibitors and almost 250 conference speakers. In case you are interested to participate in the German pavilion at REI Expo 2021, kindly get in touch with Ms. Shivani Chaturvedi (shivani@indo-german.com) from Indo-German Chamber of Commerce.

For further information please click [here](#).



(Virtual) Delegation visit to Germany: Offshore Wind Energy

21 - 24 September 2021 | Virtual

An online fact-finding mission to Germany on offshore wind energy. Here you will have the opportunity to get in touch with German experts and project developers to strengthen your business network and to inform yourself on the latest energy solutions in Germany. The event is part of the German Energy Solutions Initiative.



For further information please contact Lena C. Möller – eclareon GmbH: lm@eclareon.com and Ms Dipti Kanitkar – Delegation of Indo-German Chamber of Commerce (IGCC): dipti.kanitkar@indo-german.com or visit the [website](#).

Intersolar Europe

6 - 8 October 2021 | Munich, Germany

Intersolar Europe is the world's leading exhibition for the solar industry and takes place annually at the Messe München exhibition center in Munich, Germany. The event's exhibition and conference both focus on the areas of photovoltaics, solar thermal technologies, solar plants, as well as grid infrastructure and solutions for the integration of renewable energy. Intersolar Europe 2021 will take place between 6 and 8 October in Messe Munich.



For further information please click [here](#).

RenewX

19 - 20 November 2021 | Hyderabad, India

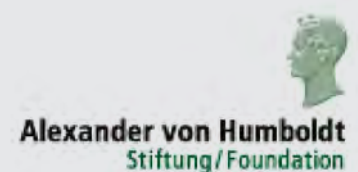
The trade fair RenewX will provide a platform that brings together stakeholders from the renewable energy sector and will help set a growth agenda for the future. There will be multiple opportunities to network with key industry experts, showcase innovations by leading manufacturers and service providers and access sector trends, all under one roof at Hitex Exhibition Centre in Hyderabad.



For further information please click [here](#).

German Chancellor Fellowship for tomorrow's leaders at German Solar Association BSW in Berlin

The Alexander von Humboldt Foundation is searching for the leaders of tomorrow from India. The German Chancellor Fellowship offers you an opportunity to take the next career step in Germany – irrespective of your field of work. In order to apply, develop your own project idea and find a host of your choice to mentor you. Once your host has confirmed, you can apply for a fellowship. German Solar Association BSW in Berlin has already offered to be a host for you. The Chancellor of the Federal Republic of Germany is the patron of this fellowship programme. The Foundation grants up to 50 German Chancellor Fellowships annually – up to ten for each country.



If you are interested in a fellowship with the German Solar Association BSW you should get in touch with Mr. Knaack via knaack@bsw-solar.de.

Retired German energy experts offering their support to Indian institutions

You are a fresh retired German engineer with experience in Energy Efficiency and already familiar with India's rich culture? Become part of the largest retired expert's database of the world, a group of more than 10 000 experts offering their German know-how free of cost to the world.



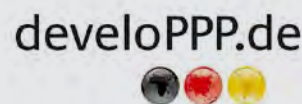
You are an Indian based company or institution and looking for a German expert to lower your expenditures for Energy?

Senior Experten Service (SES) India is constantly matchmaking German experts and Indian institutions in several fields of potential support and is also able to finance such expert visits. SES is the worldwide leading organization for voluntary assignments carried out by retired specialists and executives.

For further information please click [here](#) or contact Mrs. Sharon Mogose via sharon.mogose@indo-german.com.

Information about DeveloPPP

DeveloPPP.de is a mechanism by the German Federal Ministry for Economic Cooperation and Development (BMZ) to promote the involvement of the private sector in its development work. The BMZ provides financial and technical support to companies that want to become active in developing and emerging countries or already are and whose investment has long-term benefits for the local population. The company bears at least half of the total project costs.



Interested companies cooperate with one of the two public partners that implement the program on behalf of the BMZ: DEG - Deutsche Investitions- und Entwicklungsgesellschaft GmbH or Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. The companies receive individual advice, benefit from regional market knowledge of the locations worldwide and gain access to local networks and political decision-makers.

Projects cover a wide range of sectors, such as training local skilled workers, piloting innovative technologies and demonstration plants, to securing value chains and improving ecological and social standards in production plants.

Four times a year, companies can submit their project ideas to DEG or GIZ. The project should be developmentally effective and go beyond investments in the company's core business. To be eligible for funding, companies must have an annual turnover of at least 800,000 EUR, employ no less than 8 people and have a minimum of 2 audited annual financial statements. The duration is up to 3 years.

For further information please click [here](#).

All upcoming events in the next six months – Save the date!

8th ESS Meet-Virtual Conference

7 July 2021 | Virtual

<https://indiaesa.info/events/8th-ess-meet-virtual-conference-energy-storage-solutions-meet>**Knowledge Session on Large Scale Green Hydrogen Production**

14 July 2021 | Virtual

<https://register.gotowebinar.com/register/2179677764186241035>**Atmanirbhar Bharat – Opportunities in Renewable Energy Sector**

15 – 16 July 2021 | Virtual

<https://www.cii.in/OnlineRegistration.aspx?enc=pZVQM37jtSRTHIkmbSitheQWLbx5/FSqzJ0nTWc1XveDLETEztp8geb903uGuWA>**Renewable Energy India E-Expo**

5 – 6 August 2021 | Virtual

<https://renewableenergyindiaexpo.com/about-expo>**14th Renewable Energy India Expo 2021**

15 – 17 September 2021 | New Delhi, India

www.renewableenergyindiaexpo.com**(Virtual) Delegation visit to Germany: Offshore Wind Energy**

21 – 24 September 2021 | Virtual

www.indien.ahk.de/events/event-details/virtual-delegation-visit-to-germany-offshore-wind-energy**World Energy Storage Day 2021**

22 September 2021 | Virtual

<https://www.energystorageday.org/>**Intersolar Europe**

6 – 8 October 2021 | Munich, Germany

www.intersolar.de**RenewX Hyderabad**

19 – 20 November 2021 | Hyderabad, India

www.renewx.in**World Wind Energy Conference(WWEC) 2021**

24 – 26 November 2021 | New Delhi, India

<https://wwec2021.org/>

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DISCLAIMER

The views expressed in this newsletter are solely those of the Indo-German Energy Forum (IGEF) Support Office team. The IGEF Support Office cannot assume any responsibility for the contents of other websites linked in this newsletter.

The Support Office of the Indo-German Energy Forum provides liaison services for all stakeholders. It serves as a first point of contact both to the Indian and German governments as well as companies seeking to get involved in the process. The Support Office answers queries regarding proposals for the IGEF dialogue or IGEF projects and any other subject relevant to the private sector.

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