

Nationally Determined Contributions - Transport Initiative for Asia (NDC-TIA, India Component)

Funded under the International Climate Initiative (IKI) by the German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety (BMU)

“Simulation-based study to evaluate the effects of E-mobility smart charging strategies”

Agenda – Release of the Report: A critical review – Smart Charging Strategies and Technologies for Electric Vehicles

Date: 30th November 2021 | **Venue/Channel:** Microsoft Teams |

Timing: 15:30 to 17:30 hrs (IST) | 11:00 to 13:00 hrs (CET)

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Time (hrs.)	Event details	Speaker(s)
15:30 – 15:35 IST 11:00 – 11:05 CET	Opening remarks and welcome address by GIZ	Dr. Winfried Damm, Head- Indo-German Energy Programme, GIZ India
15:35 – 15:45 IST 11:05 – 11:15 CET	Special address by the German Embassy in India	Representative from Germany Embassy, New Delhi*
15:45 – 15:55 IST 11:15 – 11:25 CET	Keynote address and Report release by NITI Aayog	Mr. Sudhendhu Jyoti Sinha, Advisor, Infrastructure Connectivity & Electric Mobility vertical, NITI Aayog, Government of India
15:55 – 16:05 IST 11:25 – 11:35 CET	Importance of Smart charging for key stakeholders in India	Mr. Praveer Sinha, CEO and Managing Director, Tata Power Company Limited*
16:05 – 16:30 IST 11:35 – 12:00 CET	Introduction to Smart Charging (A) EV impact into the power system and power grid: challenges and opportunities (B) Smart-charging to solve challenges and bring benefits	Dr. Pablo Frias, Universidad Pontificia Comillas (IIT Comillas) Mr. Theis Rasmussen, Center for Electric Power and Energy Electric Power Systems, Technical University of Denmark (DTU)
16:30 – 17:00 IST 12:00 – 12:30 CET	About the overall Smart Charging study (A) Introduction by GIZ India (B) Details of the study by Fraunhofer IEE	Dr. Indradip Mitra, Team leader- E-mobility, Indo-German Energy Programme, Country Coordinator for NDC-TIA India Component, GIZ India



Time (hrs.)	Event details	Speaker(s)
		Dr. Norbert Henze, Fraunhofer Institute for Energy Economics and Energy System Technology IEE R&D Division Power System Stability and Converter Technology, Kassel, Germany
17:00 – 17:15 IST 12:30 – 12:45 CET	Key takeaways from the report	Mr. Andre Hartung, Fraunhofer Institute for Energy Economics and Energy System Technology IEE R&D Division Power System Stability and Converter Technology, Kassel, Germany and Prof. Zakir Hussain Rather, Department of Energy Science and Engineering, Indian Institute of Technology, Bombay (IITB), India
17:15 – 17:25 IST 12:45 – 12:55 CET	Way forward	Prof. Martin Braun, Fraunhofer Institute for Energy Economics and Energy System Technology IEE, Kassel, Germany
17:25 – 17:30 IST 12:55 – 13:00 CET	Vote of thanks	Ms. Shweta Kalia, Junior Technical Expert, GIZ India
*Tentative		

Brief Description of the Study

On behalf of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the Nationally Determined Contribution-Transport Initiative for Asia (NDC-TIA) is a joint project of seven organisations and with the engagement of China, India, and Vietnam. It aims at promoting a comprehensive approach on decarbonizing transport i.e. a coherent strategy of effective policies that are coordinated among various sector ministries, civil society, and the private sector. The detailed information on India component of NDC-TIA project can be found here - [Bolstering the India component of NDC-TIA](#).

Under the NDC TIA India Component, the study “**Simulation-based study to evaluate the effects of E-mobility smart charging strategies**” is focused on relevant smart coordinated charging strategies that will need to be adopted in different scenarios and conditions in India. This study is carried out by a consortium led by Fraunhofer Institute for Energy Economics and Energy System Technology IEE, Kassel, Germany and supported by Indian Institute of Technology Bombay in India (IITB), Universidad Pontificia Comillas (IIT Comillas) in Madrid, Spain, and Technical University Denmark (DTU) in Copenhagen, Denmark.

This study aims to answer a key question: “**What are the relevant smart coordinated charging strategies that will be needed to be adopted in different scenarios and conditions in India?**”. The answer to this question will be obtained through a detailed study focusing on EV smart charging strategies and approaches, related policy and regulatory measures, technical aspects, grid integration of EVs, and the way forward for smooth EV adaption in the Indian EV ecosystem. The study uses real data to develop models of distribution feeders in India, implement charging and coordination algorithms using a robust open-source simulation environment. This study will, thus, be conducted with the main thrust on the following focus points:

- ❖ A detailed and comprehensive global review of different smart charging strategies and coordination approaches for EV charging
- ❖ Structured framework for desired data collection from selected DISCOM(s) and other relevant sources along with data filtering and quality check
- ❖ Performing concrete simulations on smart charging strategies for EVs while considering different scenarios/use cases with the grid data provided by the DISCOM(s)
- ❖ Preparation of comprehensive and concrete guidelines for smart EV charging in India
- ❖ Conducting a detailed literature review on charging infrastructure and consumer response

The results of the analyses will act as a strong base in identifying gaps and refining scope of work for adoption of smart charging approaches at each necessary level/node of the EV ecosystem. The study based on a combination of desk research, simulation, regular workshops with the selected DISCOM(s), consultations with stakeholders, will be used to identify and recommend various smart charging interventions and guidelines that can be adopted for the use by regulators, policy makers, DISCOMs, and other stakeholders, and later adopted state-wide.

About the Report



Title: A critical review: Smart Charging Strategies and Technologies for Electric Vehicles

This report is the first in the series of the overall study – “Simulation-based study to evaluate the effects of E-mobility smart charging strategies”. This report sets the main context for the core objective of the overall study, which is to identify relevant smart charging and coordination strategies, appropriate policy and regulatory interventions, and way forward for seamless adoption of smart charging in Indian EV ecosystem. The immediate next step will be to develop a holistic framework to select key strategies for modelling different scenarios under a simulation environment leading to concrete recommendations for the stakeholders.

Part A of the report presents a comprehensive overview of smart charging concept and documents smart charging technologies and related products and solutions, equipment, commercially available chargers (along with specifications) and manufacturers in India, relevant standards, and communication protocols which can be useful for a wide set of stakeholders in the EV industry. Several case studies/projects in EV rich countries, such as Norway, Denmark, China, Netherlands, United Kingdom, United States, Germany, and Sweden are given to give a better understanding to the stakeholders about implementation of smart charging in Indian EV ecosystem. A gap analysis in the Central and state EV policies from the lens of smart charging is drawn, and subsequently key intervention points required in policies for Smart Charging, Communication, and ICT are presented.

Part B of this report is dedicated to an exhaustive and critical technical review of various smart charging strategies and approaches. This part of the report documents EV charging strategies based on control architecture and objectives, optimization algorithms used to implement smart charging, artificial intelligence/Machine learning based approach for smart charging, price-based EV charging coordination methods, Fleet control, and charging station coordination.