20 YEARS Integrated Research and Action for Development

IRADe

ANNUAL REPORT 2024–25

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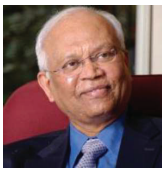
Chairman, IRADe;
Former Member,
Planning Commission

Prof. Jyoti Parikh
Executive Director, IRADe

Mr. Suresh Prabhu
Former Union Minister
of Railways



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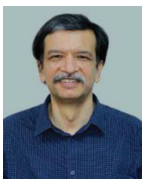
Former Director-
General, Council for
Scientific & Industrial
Research



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Former Vice- Chancellor,
Delhi University

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Bharat

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Research (XKDR)

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Former Prime Minister,
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Executive Director, IRADe

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Industrialist

Mr. Keshub Mahindra
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Consulting Civil Engineer

Group Coordinators, IRADe

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Senior Advisor, IRADe

Dr. Sudipa Majumdar
Director, IRADe

Mr. Rohit Magotra
Deputy Director, IRADe

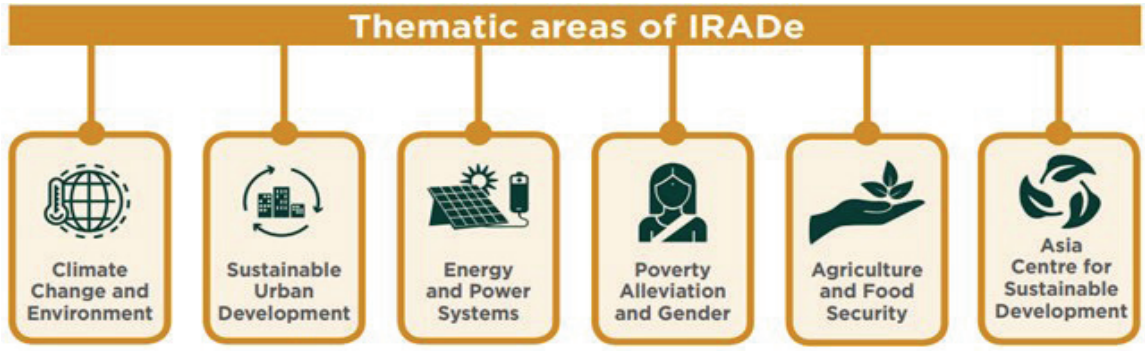
Dr. Probal Pratap Ghosh
Deputy Director, IRADe

Dr. Anjana Das
Senior Advisor, IRADe

About IRADe

IRADe is an independent non-profit advanced research institute aimed at conducting research and policy analysis to engage stakeholders such as government, non-governmental organisations, corporations, academic and financial institutions. Energy, climate change, urban development, poverty, gender equity, agriculture, and food security are some of the challenges faced in the 21st century. IRADe's research covers these issues and the policies that affect them. IRADe focuses on effective action through multidisciplinary and multi-stakeholder research to arrive at implementable solutions for sustainable development policy research and effective governance that considers techno-economic and socio-cultural issues. It also provides expertise to several ministries, national and international institutions, and partners with reputed organisations.

IRADe was established under the Society's Act, 2002, in New Delhi. It is certified as a Research & Development Organisation by the Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology (MoST), Government of India. It has also been selected as a Centre of Excellence by the Ministry of Housing and Urban Affairs (MoHUA), Government of India, for urban development and climate change.



Our Vision

To be a leading global independent policy research think tank that provides and enables implementable policy solutions for sustainable and inclusive development.

Our Mission

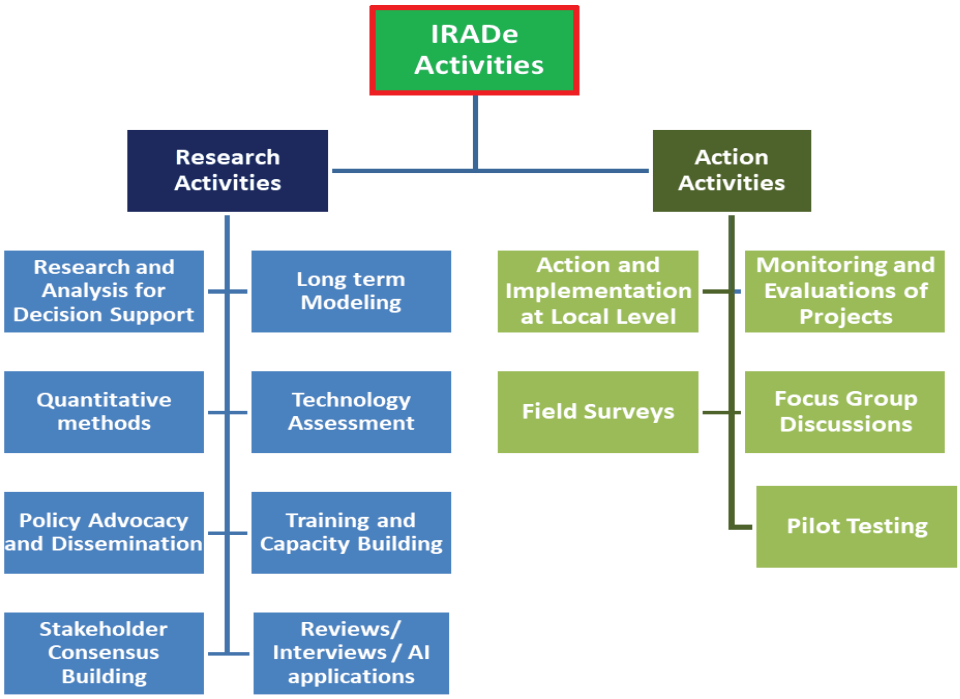
To carry out policy analysis from multi-stakeholder and multi-disciplinary perspectives for decision-makers and vulnerable groups in the thematic areas of climate change and environment; energy and power systems; sustainable urban development; agriculture and food security; poverty alleviation and gender. This is accomplished using policy research and analysis, consensus building and dialogues, capacity building, and monitoring and evaluation.

Our Objectives

- Integrate multi-disciplinary and multi-stakeholder perspectives concerning issues of development
- Promote wider consensus on effective policies through research and analysis
- Engage and work at local, district, state, national, South Asia regional and global levels
- Provide research support to developing countries for development and the negotiation process for international agreements
- Conduct policy research that considers the political economy of the society and the effectiveness of governance

IRADe's activities in these areas encompass cross-cutting themes such as technology assessment and policy reforms.

Key activities include:



From the Executive Director's Desk

We are happy to present IRADe Annual Report 2024-25 that reflects our journey for advancing sustainable development through scientific research, policy analysis, and stakeholder engagement.

IRADe's notable activities this year include a series of 5 regional comprehensive capacity building workshops for state-level stakeholders for the power sector covering the Northern, Eastern, North-Eastern, Southern and Western regions of India, in collaboration with the Central Electricity Authority (CEA), under Ministry of Power, Government of India. This initiative was led by Shri Pankaj Batra where 345 officials participated altogether across the 5 regions.

Using tools like MESSAGE-ix and IESA, Dr Probal Ghosh, Deputy Director, developed net-zero pathways for key sectors—power, residential, transport—that aligned with India's Long-Term Low Emission Development Strategy through zero-emission vehicle (ZEV) adoption, and demand-side transition strategies. Dr Anjana Das worked on green hydrogen development and its potential in the steel sector. IRADe addressed transboundary climate risks in the Hindu Kush Himalayan region, contributing to COP29 dialogues where Deputy Director Mr. Rohit Magotra emphasized inclusive, gender-sensitive heat action planning. Through technical workshops and stakeholder consultations, IRADe fostered collaboration on low-carbon strategies, including decarbonising the steel sector with green hydrogen, which reflect IRADe's commitment to supporting a just, resilient, and sustainable transition through integrated climate and energy research. IRADe continued to advance India's energy transition agenda through policy modelling, high-level stakeholder engagement, with a focus on key sectors like power, residential, transport, and steel. IRADe has also been active in the area of technology assessment, from multiple points of views, for its relevance under the present circumstances and for the future.

The year 2024-25 was also marked by several important collaboration agreements that included Memorandum of Understanding with the Ministry of Power, India Meteorological Department, Ministry of Earth Science, Indian Institute of Technology Delhi, Symbiosis International University and Shiv Nadar University. The partnerships set the stage for joint research, capacity-building initiatives, and knowledge exchange, promoting excellence and innovation.

These efforts underscore IRADe's commitment to integrate climate science, economic analysis, and policy research to support India's transition toward a low-carbon, resilient, and inclusive development pathway.

Jyoti Parikh

Prof. Jyoti Parikh

Executive Director, IRADe

Tributes for Founding Members

Dr. Manmohan Singh

First Council Meeting IRADe, 2002

IRADe's, Energy Conclave 2006

IRADe mourns the passing of Dr. Manmohan Singh, a founding member of IRADe, the Former Prime Minister of India, and a distinguished economist whose visionary leadership and unparalleled contributions have left an indelible mark on India and the world, with profound sorrow.

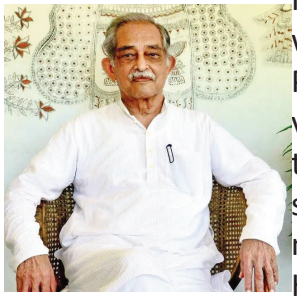
Dr. Singh's unwavering support, sharp intellect, wise guidance, and warm personality were a source of inspiration to all of us at IRADe. As a founding member, he supported our vision and played a pivotal role in shaping our mission. He graciously inaugurated IRADe's first major Energy Conclave, a 3-day event, where there was a comprehensive debate on diverse aspects of the energy sector. He took keen interest in IRADe and participated despite his busy schedule.

Dr. Kirit Parikh, Chairman IRADe, worked directly with him as a Member of Planning Commission (2004-2009).

Dr Jyoti Parikh, Executive Director IRADe, served as a Member of Prime Minister's Advisory Council on Climate Change from 2007-2010.

India has lost not only a pioneer in the field of economics and governance but also a cherished mentor and advocate for sustainable and inclusive development. His legacy will forever remain a guiding light for us and future generations.

Shri. Shirish B Patel



IRADe conveys great sorrow at the demise of Shri Shirish B Patel, who was IRADe's founding member and renowned Civil Engineer and Urban Planner. Shri Patel was a strong supportive and active contributor to our vision. He was an outstanding and pioneering structural engineer and a town planner, deeply concerned with the ease of living for the poor. He suggested the idea of the twin city of Mumbai, known as Navi Mumbai now, along with architect Charles Correa and Praveena Mehta.

His passion for finding practical solutions that benefit all stakeholders has helped IRADe in its work. IRADe lost a great supporter and a believer. Our heartfelt condolences to his family and loved ones. May his soul rest in eternal peace.

Contents

1 Climate Change and Environment

1.1 Assessing Energy Transition Pathways: Analysing Energy Demand for Low Carbon Interventions

A) Residential Sector: IRADe is engaged in project titled "Assessing Energy Transition Pathways: Analysing Energy Demand for Low Carbon Interventions", aimed at developing residential energy demand model and expanding its transport sector model (which currently includes road transport) to further include railways, waterways, and airways. The core objective is to support India's transition to a low-carbon pathway development goal by 2070 through the promotion of clean fuels, such as electricity as a key energy source for households, and improved demand-side energy efficiency. The project focuses on technological interventions in the residential sector, specifically targeting cooking, heating, lighting, and transport activities. Based on NSSO's 78th round (2020) and appliance ownership data, LPG has become the dominant cooking fuel nationally, used by 62% of households. For lighting purposes 98.9% use electricity (including electricity generated from solar or wind power) and only 0.67% relied on kerosene for lighting. Despite this successful nationwide electrification, traditional biomass fuels still account for a significant share of cooking, especially in rural India, where 66.4% of households relied on firewood. Preliminary regression analyses and modelling indicate that household expenditure levels, education, gender of the household head, and social group significantly influence energy choices and appliance adoption. Urban households are more likely to own and purchase appliances such as fans, refrigerators, TVs, and air conditioners.

B) Transport Sector: IRADe is expanding its transport sector model from road transport to railways, waterways, and airways. The data from Indian Railways, for route length, extent of electrification, gauge-wise distribution, passenger originating, track, and revenue structures reveals that over the past six decades, Indian Railways has demonstrated significant progress in infrastructure and operations. The total route length expanded from 53,596 km in 1950–51 to 64,460 km by 2010–11, while electrified tracks increased from 19,607 km to 67,723 km of electrified tracks in March 2025. This growth was accompanied by a substantial rise in investments, with capital rising from INR 827 crores in 1950–51 to INR 1,43,221 crore in 2010–11, indicating the sector's evolving capacity to support future mobility and economic development. The shift towards electrification and modernization is evident, with higher electricity consumption and reduced reliance on diesel.

Supported by: International Sustainable Energy Foundation (ISEF)

1.2 Assessment of Hydrogen as Option for Indian Steel Sector

With the partnership of the Federation of Indian Chambers of Commerce and Industry (FICCI), IRADe undertook a study to explore decarbonisation pathways for the Indian steel industry, focusing on the role of green hydrogen applying scenario analysis. Three scenarios are developed -

- **BAU scenario:** steel industry grows without any constraint on emissions
- **STBL60 scenario:** emissions increase to peak in 2035 and then decline gradually to stabilize at 100 million tonnes in 2060 and thereafter.
- **STBL70 scenario:** emissions peaks in 2040 and then decline to stabilize at 100 Mt from 2070 onwards.

Technologies considered for future expansion or replacement of existing steel capacity are -

- **Conventional technologies:** BF+BOF+BAT (best Available Technology), DRI (Coal) + Electric Arc Furnace (DRI-CL-EAF), DRI (Natural gas) + Electric Arc Furnace (DRI-NG-EAF), Scrap - Electric Arc Furnace
- **Low carbon technologies:** DRI (Green Hydrogen) + Electric Arc Furnace (DRI-GH2-EAF), Smelter – BOF + CCS (SM-BOF+CCS), DRI (Natural gas) + EAF +CCS (DRI-NG-EAF+CCS).

Some important assumptions include - availability of low carbon technologies for adoption in India after 2030; decreasing CAPEx of DRI-GH2-EAF; domestic and imported scrap price at 450 USD/tonne and limited scrap availability; natural gas price as USD 10/MMBTU, round-the-clock renewable electricity to be supplied to the electrolyser located at the steel plant site at USD 50/MWh; upper limit on cumulative CO2 storage is 10 Giga Tonne (Gt) during 2030-2075 and CO2 transport and storage cost at USD 20 per tonne. Two decarbonization pathways (one fast and one slow) provide useful inputs to the steel industry to design its net zero pathways and would be useful for the investment planning and policy making. Green hydrogen could play important role in decarbonization if future technology development and availability match the expectation together with the infrastructure support and green electricity supply.

1.2.1. Webinar

Under the DST project, IRADe and FICCI co-organised a webinar on "Decarbonisation Pathways for the Indian Steel Industry: Role of Green Hydrogen," on 30th May, 2024. This event focused on the crucial role of green hydrogen in sustainability of the iron and steel sector, bringing together industry experts. Dr. Anjana Das, Project Investigator, examined steel technologies and options for integrating hydrogen into the steel machinery.

The webinar, attended by over 300 participants, featured contributions from key stakeholders. Prof. Jyoti Parikh welcomed the representatives from Ministry of Science and Technology, GoI, Ministry of Environment, Forest and Climate Change, GoI, and corporate experts on steel at the opening session. Prof. Kirit Parikh chaired the session, which included representatives

of UNDP India, Jindal Steel and Power, IIT Bombay, the Organisation for Economic Co-operation and Development (OECD), among others.

Partner: Federation of Indian Chambers of Commerce & Industry (FICCI)

Supported by: Department of Science and Technology (DST), Government of India

1.3. Roadmap for Adoption of Zero Emission Vehicle (ZEV) in India

Building on the foundation of the previous year, this work probes deeper into the evolving trends and dynamics of India's transition towards Zero Emission Vehicles (ZEVs). In addition to environmental and energy-related outcomes, the study places strong emphasis on economic and social impacts of ZEV adoption. One of the key objectives is to assess how the shift toward ZEVs will affect employment in the supply chain of India's automobile manufacturing sector, including product repairs and auto parts. Industry data was procured from Society of Indian Automobile Manufacturers (SIAM), Annual Survey of Industries (ASI) and Economic and Political Weekly Research Foundation (EPWRF), on transportation and automobile ancillaries with respect to sales, production, manufacture, market share etc. Total passenger vehicle sales showed a steady rise, with a dip during 2019-21, due to economic slowdown and the pandemic. Passenger car sales peaked in 2017-18 but declined thereafter. Multi-Utility Vehicle sales grew consistently, with a sharp rise after 2020, showing a shift in buyer preferences toward larger vehicles. Two-wheelers maintained strong sales growth until 2018-19 while three-wheeler sales stayed relatively stable.

Structured questionnaires were tailored to three distinct stakeholder groups: (i) industry associations, (ii) automobile manufacturing companies, and (iii) equipment and component ancillary firms. The interview findings formed the basis of our policy brief that summarizes key insights, expectations, challenges, and policy recommendations voiced by supply-side stakeholders. It aims to inform decision-makers about the readiness of and the support mechanisms required to facilitate a just and effective ZEV transition.

In the short to medium terms, both ICE and ZEV vehicles markets will co-exist One of the key concerns of the industry is the lack of skills required for ZEV manufacturing, due to the different propulsion technologies. While workforce might shrink in the longer run, it is unlikely to impact the current workforce. In fact, the transition may initially boost employment, with emergence of new sector and evolving demands, even as some existing roles become obsolete in the long run. The future hiring structure may change, focusing more on ZEV-specific skills. Another major concern was protection of the industry from external competition in the short run, as Indian ZEV is in its nascent stages. The ancillaries in the long run may be lesser in numbers and larger in size due to automation and stringent quality assurance requirements. Additionally, formal after-sales services are expected to expand, given the higher cost and complexity of ZEV components, which require specialized skills for repair and maintenance.

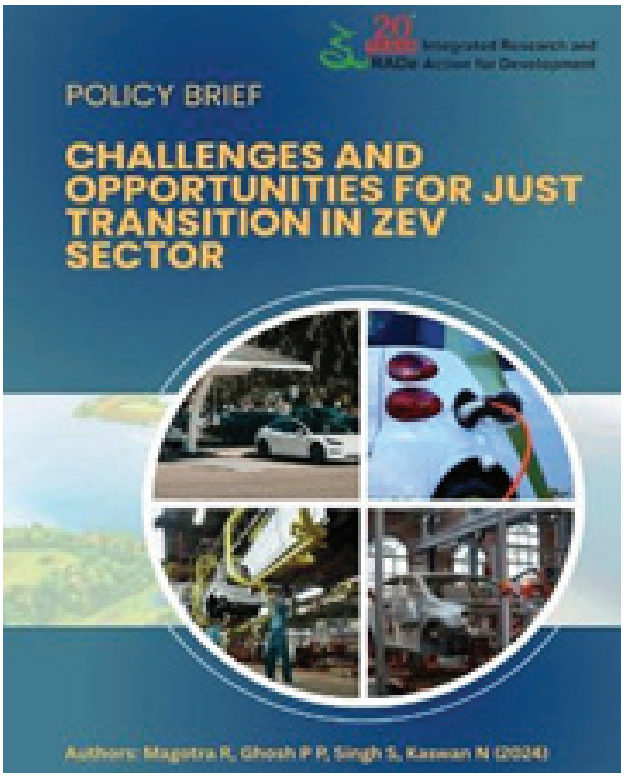
The project also includes an all-India survey of stakeholder preferences for fuel and mode choices in transport, for understanding the demand side indicators. We segregated the sector in six groups: a) Two-wheelers private owners; b) Four-wheeler private owners; c) Three-wheeler passenger fleet owner; d) Four-wheeler taxi fleet owners; e) Bus fleet owners; f) Freight fleet owners.

The survey would be used to compute charging profiles of current users of EVs across India. This would help to compute the impact on distribution grid at the macro level and city-levels, similar to our previous study for Delhi city where we found that the impact of EV charging would be 17% on weekday and 4% on weekend for peak months in 2030. By combining macro-level transport modelling with micro-level insights from industry and workforce data, as well as a nationwide stakeholder survey, the project provides a holistic view of the opportunities and challenges in transitioning to a ZEV system.

As India moves towards its net-zero commitments, this roadmap aims to serve as a practical and inclusive guide for policymakers to ensure that the ZEV transition is both sustainable and economical. Key informant interviews with senior management and representatives of automobile manufacturers, ancillary industries, servicing industries and automobile associations assessed the impacts of ZEV transition.

A Policy brief was developed on Challenges and Opportunities for Just Transition in ZEV sector based on the stakeholder interviews.

1.3.1. Stakeholders Consultation



The Indian automotive landscape presents opportunities for growth and adaptation, allowing ICE and ZEV technologies to evolve together in a dynamic market. ICE vehicles, hydrogen, and CNG technologies may continue to coexist in short to mid-term. Export markets of ICE vehicles may persist despite domestic ZEV adoption. Most stakeholders opined that with adequate demand for ZEVs, the industry will respond with supply. Government initiatives like FAME II (Faster Adoption and Manufacturing of Electric Vehicles), the upcoming FAME III and other similar policies are expected to continue to drive demand.

However, supply-side challenges persist, including the need for localisation of cell manufacturing and electronics supply chain. In the initial phases, government

should provide protection from external competition. Government action is also critical for securing seamless supply chain, specifically for rare-earth minerals essential for commercial-scale battery production. A shift from ICE vehicles to EVs is unlikely to cause major employment disruptions but demands upskilling where the government and OEMs (original equipment manufacturers) must play pivotal roles in training the workforce. With over 1.5 million EVs, the growing market will create jobs in manufacturing, supply chains, and services. Semi-skilled workers can transition to EV roles with minimal training, while mid-to-senior roles need targeted reskilling, particularly in electric motor and battery technologies. Retraining the force, upskilling informal labour force in vehicle repair and maintenance would be key areas requiring joint efforts from industry and government.

Supported by: International Sustainable Energy Foundation (ISEF)

1.4. Pathways for Green Hydrogen Development in India

Indian policymakers recognise the critical role of green hydrogen in improving energy security and achieving Net Zero by 2070. The National Green Hydrogen Mission (NGHM) aims to make India the Global Hub for production, usage and export of Green Hydrogen, building capabilities to produce at least 5 MT of Green Hydrogen per annum by 2030, with a potential of reaching 10 MT. Key objective of this project is to strengthen the policy and decision-making process by providing relevant quantified technical and economic information regarding development of hydrogen fuel chain (water electrolysis) and inter-connected Indian power system for the time horizon 2030-70. A least-cost integrated modelling framework of the Indian power system and hydrogen fuel chain, based on International Atomic Energy Agency's MESSAGE software, is used for simulating scenarios with exogenous demand for electricity (industry, households, etc.) and green hydrogen.

In the form of scenarios, two green hydrogen production pathways are considered based on green electricity supply modes to the electrolysers: (1) GRNGRIDH2: a hybrid system of solar PV, wind onshore power plants, and battery storage connected with separate transmission and distribution networks delivering green electricity to the electrolysers; (2) GRNSITEH2: electrolysers coupled with solar PV plants and battery storage located at the same site at the demand point, drawing green electricity.

Additionally, there is (3) NoH2BAU when the power system only meets conventional electricity demand, and no hydrogen production occurs.

Comparing the results with the NoH2BAU scenario, impacts on the power system due to introduction of hydrogen production are quantified. Hydrogen storage and transportation, electrolyser manufacturing and critical minerals are addressed with policies measures.

1.4.1. Launch of Study Report

Shri Bhupinder Bhalla, Secretary, Ministry of New and Renewable Energy (MNRE), unveiled IRADe's latest report titled "Roadmap for Green Hydrogen Development in India," authored by Dr. Anjana Das, Senior Advisor, IRADe and Prof. Kirit Parikh, Chairman, IRADe. The report explores scenarios for integrating hydrogen fuel chains with India's power system (2030 – 2070) and sheds light on electrolyser capacity requirements, green electricity demand, investment needs, and green hydrogen potential.

Supported by: International Sustainable Energy Foundation (ISEF)

1.5 Assessing Fiscal Policies to Support Adoption of Technologies for a Net Zero Transition in Power Sector using an Integrated Economy-Energy Model

The project covers a 30-month period from Feb 2022 to Jul 2024, under the EU's foreign policy instruments European Union Climate Dialogues (EUCDs). This succeeded the Strategic Partnership for Implementation of Paris Agreement (SPIPA) of EU. The broad objectives were to carry out capacity building of teams for setting up modelling tools and techniques for low carbon modelling through exchange of expertise and knowledge between Indian and EU teams.

IRADe collaborated with IIASA to develop two long term models– (1) MESSAGE ix based power system model for India; (2) CGE model based on Negishi framework.

This study set up an integrated economy-energy MESSAGE-ix based power systems model to assess the price and quantity impacts of low carbon policies and implications for the power system; outline market measures and fiscal policies like taxes / subsidies / other economic policies to implement net-zero pathway in the power sector.

IRADe's integrated economy-energy model, projects a transformative shift in India's power sector under the Net Zero scenario, with total electricity generation rising sharply from 2,121 TWh in 2025 to 12,505 TWh by 2070, driven by rapid growth in renewable energy, nuclear power and improvements in coal technologies. Solar PV without storage and onshore wind will become the backbone of renewable generation, while nuclear power sees a significant rise from 105 TWh to 5,336 TWh, emerging as a crucial low-carbon baseload option. Hydro power will peak mid-century and stabilize at 509 TWh by 2070.

Although coal's share declines, it remains part of the energy mix due to its role in ensuring grid reliability and meeting industrial demand. However, there is a

shift from subcritical to more efficient supercritical and ultra-supercritical coal technologies. Subcritical coal would be phased out by 2040. Despite reduced utilization, around 400 GW of coal capacity will become stranded by 2070, operating at low plant load factors, reflecting challenges in transitioning from legacy infrastructure.

In terms of costs, the Net Zero pathway is financially favourable in the long run. Annual system costs peak at USD 292 million by 2055, then decline to USD 195 million by 2070, indicating that sustainable energy investments lead to long-term economic benefits. Emissions rise till 2050 due to system inertia and rising demand, and then fall sharply, reaching 1,500MT by 2070. In contrast, the business-as-usual scenario shows emissions persisting at 3,120MT, revealing inadequacy of current policies to meet climate targets.

India's net zero energy transition will need to strategically balance increasing renewable penetration with reliability provided by coal and nuclear energy. While falling costs of solar and wind facilitate their expansion, their intermittency necessitates complementary investments in storage technologies and nuclear power. Smart coal phase-out strategies, like plant retirement planning and repurposing, along with accelerated nuclear development, are vital to achieve the 2070 Net Zero target. Overall, the study underscores that an integrated, multi-technology approach is essential to ensure energy security, reduce emissions, and manage long-term system costs effectively during India's low-carbon transition.

Figure 1: Projected installed annual capacity (GW) and generation (TWh) under BAU and Net Zero scenario

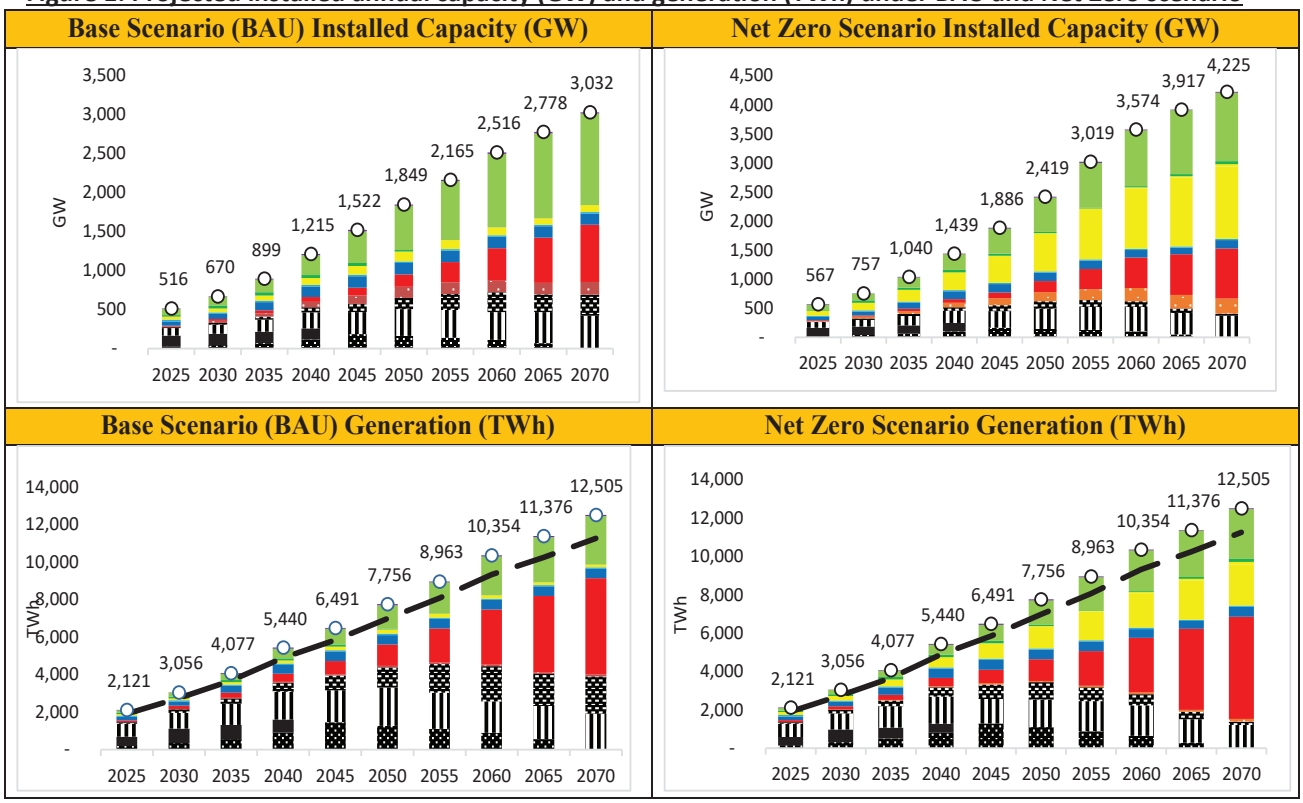
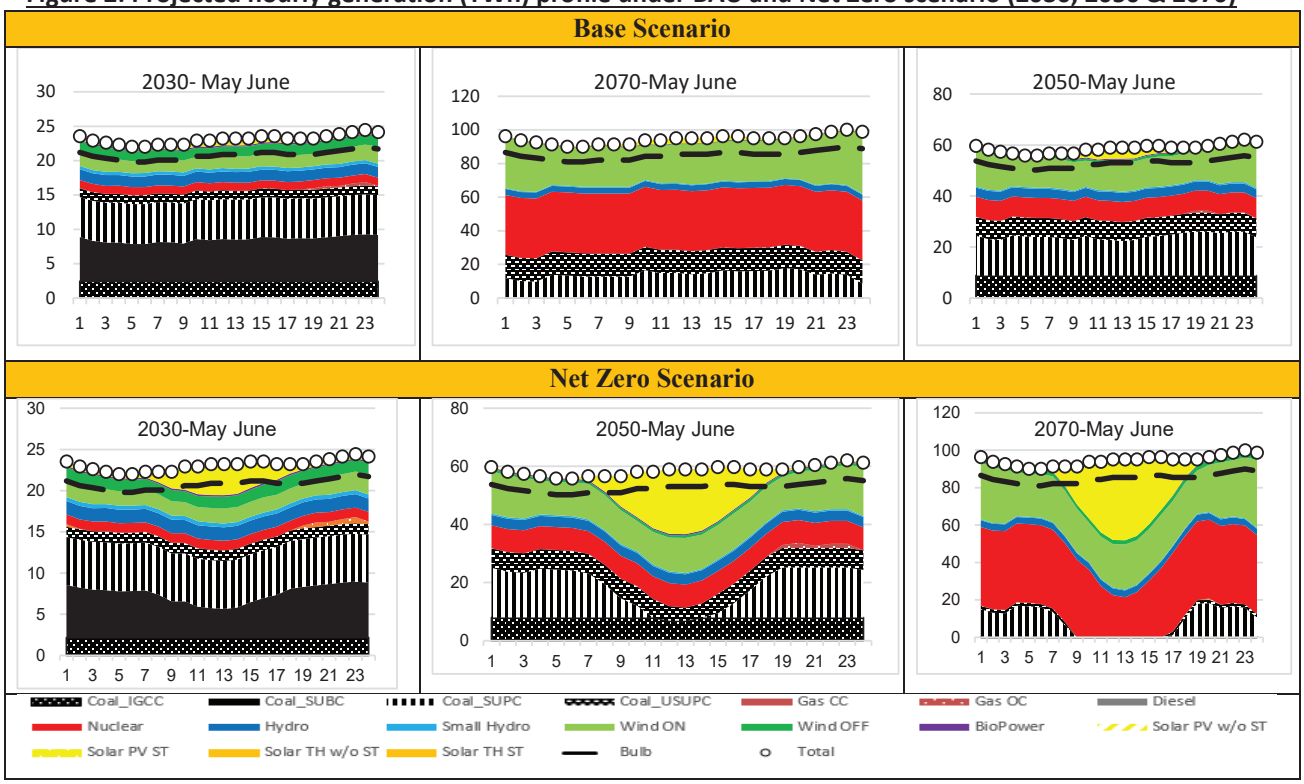


Figure 2: Projected hourly generation (TWh) profile under BAU and Net Zero scenario (2030, 2050 & 2070)



Source: IRADe's analysis

Computable General Equilibrium (CGE) model based on Negishi framework:

IRADe's Activity Analysis based macro-economic model was upgraded to a CGE model for assessment of fiscal policies and price impacts based on the Negishi formulation where the weighted sum of class wise consumption utility is maximised by iterating over weights to obtain a general equilibrium solution that satisfies final demands at aggregate level and also class wise income and expenditure balances. The Negishi formulation based CGE model allows for a detailed sectoral technology representation with alternate technologies for electricity sector for power generation.

The model follows the classifications in the SAM where the production side is characterised by 41 commodity-producing sectors. There are 20 household classes, ten each in rural and urban areas, taking production, consumption and investment decisions based on the price signals from the market. Government is the only other agent, which is engaged in the economic decisions besides determining the overall policy structure. The model characterises the functioning of the real side of the economy. We make a comparative analysis of 3 carbon tax scenarios – 10$, 20$ and 40$ carbon tax per tonne of CO2 emitted with respect to Reference scenario. The impact of these taxes are shown in Figure 3 below.

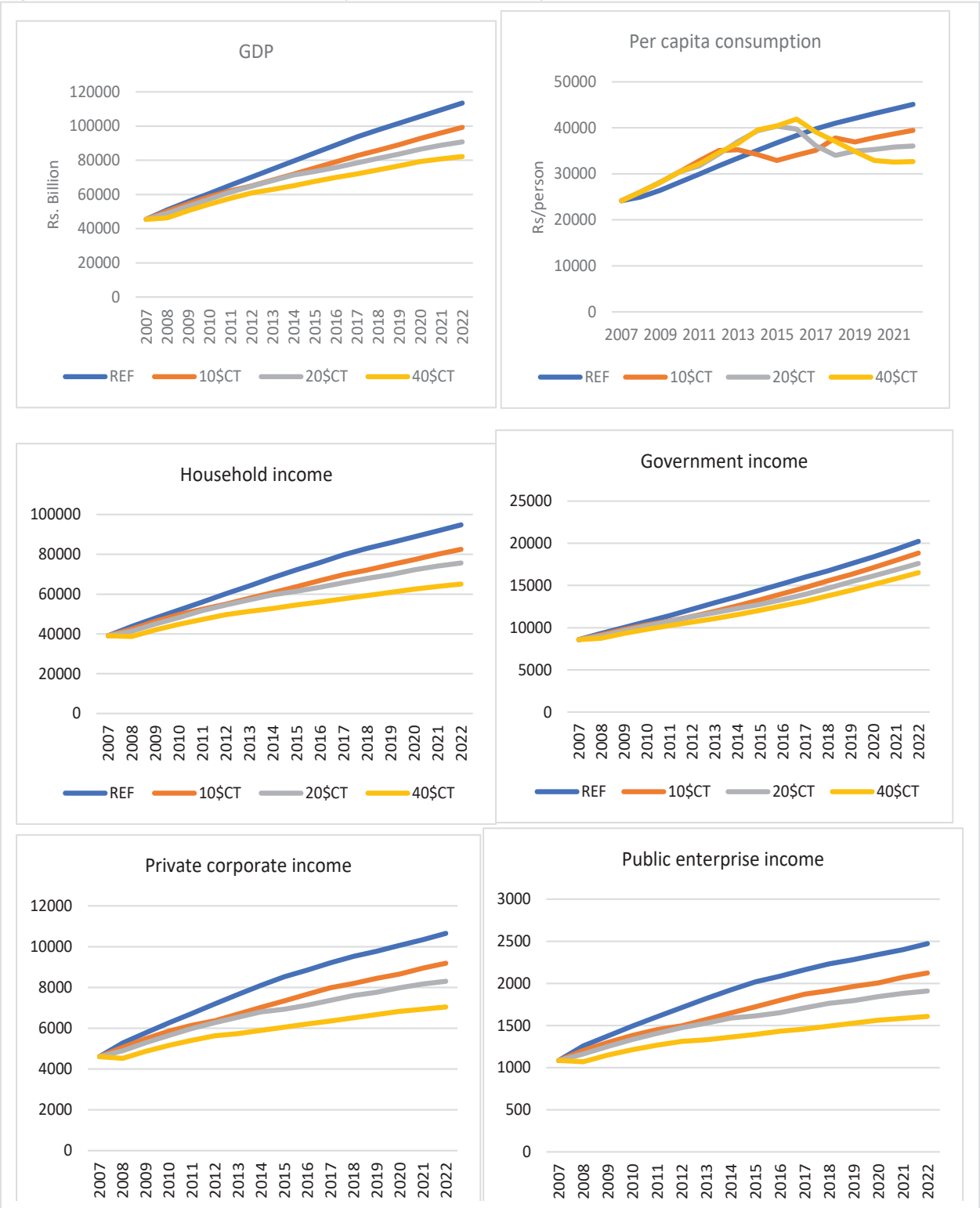
Carbon tax has a strong negative impact on income, GDP and consumption in the economy. However, since the economy is stimulated only for short period of 15 years from 2007-08 to 2022-23 and without technological low carbon alternatives in any other production sector except power this reduces the ability of carbon tax to incentivise low carbon choices in other sectors of the economy leading to economic losses. In conclusion, IRADe feels that the model needs to include more alternatives and for longer forecast analysis.

1.5.1 Fourth Technical Exchange Workshop on Low Carbon Modelling

IRADe hosted the 4th Technical Exchange Workshop on Low Carbon Modelling as part of the EUCDs project, on 24 June 2024. The EUCDs is supporting activities related to low carbon modelling in India, with technical exchange with European modelling teams including International Institute for Applied Systems Analysis (IIASA) and Joint Research Centre (JRC). This event featured presentations from Indian modelling teams, showcasing their work and inviting collaborative inputs. Prof. Kirit Parikh provided remarks on achieving net zero and sustainable development and discussed the importance of policy incentives to align sector behaviour with proposed scenarios and projections. He emphasized that meeting targets are not only about consumption but also about how sectors adapt. Prof. Jyoti Parikh highlighted IRADe's collaboration with IIASA. Dr. Probal Ghosh presented on "Technological Pathways for Net Zero in India's Power Sector in MessageIX Based Analysis," highlighting the importance of coal technology in India. Nuclear power can replace coal as a base load technology and therefore ramping up its efforts to build nuclear capacity is essential to fully eliminate coal by 2070.

Supported by: European Union through GIZ

Figure 3: Economic and welfare impacts of carbon tax policies



1.6 IRADe's Participation in Aalborg University, Denmark

Prof. Jyoti Parikh delivered a keynote address at Aalborg University at the 10th International Conference on Smart Energy Systems on 11th September 2024. The keynote plenary session focused on The Role of Hydrogen in the Green Transition. The conference covered the experiences of three different countries, viz; India, China and Germany.

Prof. Jyoti Parikh highlighted that the three countries are at different stages of development and India is decarbonising while it is growing. While Germany is a mature economy and China has grown substantially in the last two decades. India has committed US$100 billion with a goal of green hydrogen of 5 million tonnes that could be used for export or for high energy intensive industries. She said even corporate sector has joined focusing various aspects of the Hydrogen Value chain - mixing in natural gas pipeline, Storage and delivery technologies, electrolysers and fuel cells, steel and green hydrogen for export purposes, etc. Discussing IRADe's modelling scenarios, she pointed out the challenges of meeting the targeted production.

2 Asia Centre for Regional Cooperation

2.1 Electricity Grid Interconnection Masterplan for the BIMSTEC Region

IRADe had been commissioned by the Asian Development Bank (ADB) to develop an Electricity Grid Interconnection Masterplan for the BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation) region, encompassing Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand. The primary objective of this project was to estimate the trading potential within the region and, based on these estimates, to provide an optimal transmission plan for grid interconnections across the member states. This initiative aims to facilitate feasible trade by examining the policies and regulations governing cross-border electricity trade and promoting clean energy transitions in each country. The project was also to examine the existing national and cross-border transmission systems and planned developments up to the year 2040. It was to propose new interconnections and/or strengthen existing regional grid interconnections between and within the member countries, in the most optimal and cost effective way, considering a Regional perspective, based on the trade anticipated. This strategic approach is designed to enhance regional energy cooperation and attract investment to make it a reality. The High-level Grid Interconnection Master Plan was initially submitted in July 2023. After receiving feedback from the BIMSTEC countries and ADB, revisions were made, and the final draft High-Level Report was submitted to ADB. Subsequently, it was shared with the BIMSTEC countries through the BIMSTEC Secretariat. The findings and recommendations of the report were disseminated at the BIMSTEC Grid Interconnection Masterplan Workshop on Cross-border Transmission Lines Optimisation, held from 18-20 February 2024 in Dhaka, Bangladesh. A consolidated Master Plan was made by IRADe, tasked to look at the overall policy and regulatory environment, and MHI (Manitoba Hydro International), the other partner tasked to do system studies. The study highlighted the complementarity of supply sources and in demand, as given below.

Figure 4: Installed Capacity Generation mix in BIMSTEC Region

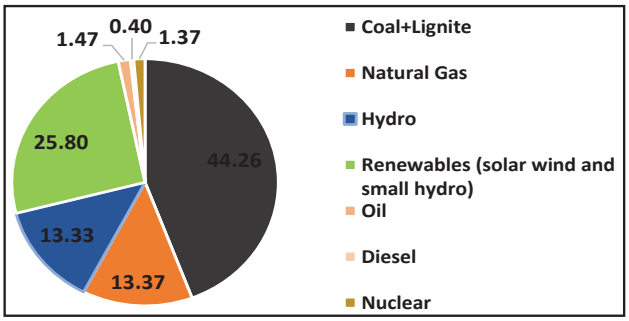


Table 5: Seasonal and Daily Demand Diversity in BIMSTEC Region

	Peak demand months	Hourly peak demand local time	Hourly peak demand India reference time
Bangladesh	March to October	20.00 hrs to 23.00 hrs	19.30 hrs to 22.30 hrs
Bhutan	November to January	18.00 hrs to 22.00 hrs	17.30 hrs to 21.30 hrs
India	June to September	11.00 hrs to 15.00 hrs	11.00 hrs to 15.00 hrs
Myanmar	May and October	18.00 hrs to 21.00 hrs	17.00 hrs to 20.00 hrs
Nepal	July and August	19.00 hrs to 21.00 hrs	18.45 hrs to 20.45 hrs
Sri Lanka	April	18.00 hrs to 22.00 hrs	18.00 hrs to 22.00 hrs
Thailand	March to June	10.00 hrs to 17:30 hrs	7.30 hrs to 15.00 hrs

The trade in the BIMSTEC Region is expected to grow from 17886 GWh in 2022 to 22800 GWh in 2035 in the Business-as-usual scenario. Based on further comments received from the BIMSTEC countries, final comments were given by IRADe to ADB in August-September 2024. The Report is under finalization by ADB.

Supported by: Asian Development Bank (ADB)

2.2 Webinar on 'Heatwave Early Warning and Heat Action Plans in South Asia'

IRADe, in collaboration with the South Asia Heat Health Information Network (SAHHIN) and the South Asian Meteorological Association (SAMA), co-organised a webinar on 'Heatwave Early Warning and Heat Action Plans in South Asia.' This event concluded with critical updates on managing and preparing for heat stress in the South Asian region. It highlighted key strategies including the development of early warning systems, the establishment of resilient infrastructures like cooling centres, and the implementation of comprehensive public awareness campaigns. Recognising the necessity for international cooperation, the webinar also addressed the need for impact-based warnings, the integration of scientific research into policymaking, and the creation of climate-adaptive, gender-sensitive action plans. These initiatives aim to bolster regional resilience and safeguard vulnerable populations against the increasing threats posed by extreme heat conditions.

Moving to the next level involves assessing the impact on various sectors, including agriculture, water, energy, and health. Each sector will have different thresholds corresponding to different temperatures. As the frequency, intensity, and duration of heat waves increase, their impact extends beyond human health to social, economic, ecological, and biodiversity aspects. The meteorological community needs to collaborate with sector specialists to develop impact-based warnings. The Indian Meteorological Department (IMD) has initiated this process, and organising training programmes on developing impact-based warnings for neighbouring South Asian countries would be beneficial.

Co-organisers: South Asia Heat Health Information Network (SAHHIN), South Asian Meteorological Association

Date: 9th May 2024

3 Energy and Power Systems

3.1 National Capacity Building Program for State-level Regulatory & Implementing Institutions on Resilient, Inclusive, & Environmentally Sustainable Power Sector

The increasing energy demand and the need for sustainable development necessitate an active role of state-level stakeholders in the power sector. While most laws, policies, and regulations governing the sector are formulated by the Central Government, their implementation lies primarily at the State level. Knowledge transfer of existing policies and regulations to new recruits is required, as also refreshing the knowledge and clarification of doubts of the existing state stakeholders.

To address this, IRADe in collaboration with the Central Electricity Authority (CEA) under the Ministry of Power, Government of India, launched a National Capacity-Building Program, for state stakeholders, i.e. Ministry level, State regulatory Commissions, State Utilities and State Renewable Development agencies, that aimed to strengthen the understanding of state stakeholders, ensuring informed decision-making in the evolving power sector landscape. This program featured in-depth technical presentation and discussions on Laws, Regulations, Rules, Guidelines, etc., related to crucial grid-related topics such as grid balancing, grid stability due to intermittent generation, ancillary services regulations, demand response, resource adequacy, demand forecasting, power generation resource planning, renewable generation and energy storage planning, power trading and power exchange in India. Additionally, the initiative strengthened co-operation among various state-level governments, at the same time acting like a feedback mechanism for the policy and regulation makers to consider issues of the States, if any, creating a well-informed mechanism to drive future energy policies and implementations. This was carried out through conducting Region-level in-person Workshops and all-India webinars, both on important Rules, Regulations, etc. as desired by the States, as well as high level webinars, on broad topics like Vision for the power sector in India, approach in the power sector towards Viksit Bharat, etc.

Supported by: International Sustainable Energy Foundation (ISEF)

3.1.1. Capacity Building Workshops for Regional Stakeholders

IRADe, in collaboration with the Central Electricity Authority (CEA), organized a series of regional Capacity Building Workshops on "Resilient, Inclusive, and Environmentally Sustainable Power Sector" across India. These Workshops aimed to strengthen the knowledge of key stakeholders, including ministries, state electricity regulatory commissions, power utilities, and renewable development agencies, on electricity laws,

policies, technological advancements, and best practices.

Each Workshop provided a platform for technical discussions, ensuring that state stakeholders are well-equipped to navigate the evolving power sector landscape. Through these efforts, IRADe and CEA have contributed to building state-level capacities in energy governance and promoting a sustainable and resilient power sector. The five workshops conducted were as follows:

Northern Region – Lucknow, Uttar Pradesh (July 2-3, 2024) with 65 participants

Shri Ashish Kumar Goel (IAS), Chairman, UPPCL, reported a 10% rise in electricity demand in Uttar Pradesh and outlined the state's preparedness. Shri Arvind Kumar, Chairperson, UPERC, emphasized the need for flexible thermal power and energy storage to accommodate rising renewables. Shri Ghanshyam Prasad, Chairperson of CEA gave the Keynote address. He stated that a number of Rules were made by the Ministry of Power to ensure that the Distribution companies and hence the power sector do not become unviable, as well as Rules on Consumer Rights. This was followed by presentations by the authors of various regulations of CEA and CERC, as well as presentations by the Grid Controller of India and the Power Exchange.

Eastern Region – Patna, Bihar (October 17-18, 2024) with 77 participants.

Shri Mahendra Kumar, MD, Bihar State Power Generation Company Ltd., highlighted Bihar's potential for hydel energy but limited renewable energy potential. Shri Amir Subhani, Chairperson, Bihar State Electricity Regulatory Commission, shared Bihar's 98% electrification achievement and AT&C loss reduction below 20%. Shri Ghanshyam Prasad, Chairperson CEA, and Keynote speaker, emphasized the need for a dynamic resource adequacy plan by each State, integrating state and central grid codes while leveraging AI and smart meters. He mentioned about updating the National Electricity Policy by the Government of India, aiming for a vision that extends to 2047.

North Eastern Region – Guwahati, Assam (November 21-22, 2024) with 48 participants

Shri Bibhu Bhuyan, MD, Assam Power Generation Corporation Limited, discussed the need for affordable power solutions, as costs were higher, because of the difficult areas of the North-Eastren Region. , Shri Debajyoti Das, MD, Assam Electricity Grid

Corporation Limited, stressed the need and role of electricity laws and technology adoption. Dr. Jaideep Baruah, Director of Assam Energy Development Agency, stated that they were exploring the potential of micro and mini hydro, and are working on pilot demonstration projects with the aim to contribute to the renewable energy scenario in Assam.

Western Region – Vadodara, Gujarat (January 23-24, 2025) with 97 participants.

The Vadodara workshop highlighted Gujarat's renewable energy leadership. Shri Ghanshyam Prasad, Chairman CEA, emphasized grid stability, regulatory compliance, and cybersecurity. Mr. Somes Bandyopadhyay, MD, Gujarat State Electricity Corp Ltd., discussed the state's advancements in battery storage and digital transformation. Mr. Upendra Pande, MD, Gujarat Energy Transmission Corp Ltd, spoke about managing energy fluctuations between the daytime surplus to the night time deficits, as well as power quality concerns. Shri Arun Mahesh Babu, Managing Director, Gujarat Power Corporation Limited (GPCL), highlighted Gujarat's achievements in renewable power, stating that 18 GW of renewable power would be achieved in the Khavda Renewable Energy Park by June 2025. Mr. Lokesh Chandra, IAS, CMD, Maharashtra State Electricity Distribution Co. Ltd (MSEDCL) shared Maharashtra's initiatives in resource adequacy planning, cost optimization, and distributed RE for agricultural load, citing the MukhyaMantri Saur Krishi Vahini Yojana. Mr. Anand Kumar, Former Chairperson, GERC & Professor of Practice, IIT Gandhinagar urged utilities to budget for training as part of ARR submissions and called for a consultative approach between regulators and utilities to refine regulations pragmatically. Shri Jai Prakash Shivahare, IAS, Managing Director, Gujarat Urja Vikas Nigam Ltd (GUVNL) highlighted GUVNL's proactive establishment of a decarbonization cell, now evolved into the Center for Net Zero Energy Transition (CNET), to plan long-term strategies. Shri Ghanshyam Prasad, Chairman CEA, gave the Keynote address. He highlighted hydro pumped storage as a priority, given its potential in western states. He touched upon innovative technologies such as hydrokinetic turbines and emphasized the role of CEA's safety, communication and cyber security regulations.

Southern Region – Hyderabad, Telangana (February 20-21, 2025) with 45 participants.

Shri Musharraf Ali Faruqui, CMD, Southern Power Distribution Company of Telangana Ltd, highlighted the critical need for a paradigm shift in the energy sector,

emphasizing the evolving demands of achieving a net-zero future. Shri Karnati Varun Reddy, CMD, Northern Power Distribution Company of Telangana Limited, stressed regulatory alignment and safety standards. Shri I. A. Khan, Former Chairman, Telangana Electricity Regulatory Commission pointed out that while India has made commendable progress in renewable energy capacity addition, the next frontier lies in grid optimization and balancing through energy storage and advanced system management. Dr Justice Devaraju Nagarjun, Chairman, Telangana Electricity Regulatory Commission, called for deeper public consultation, stronger research-based policymaking, and tailored approaches that reflect the unique energy profiles and challenges of individual states like Telangana.

The regional workshops played a vital role in advancing discussions on resource adequacy, grid stability, renewable integration, and regulatory compliance, contributing to a more resilient and sustainable power sector in India. Experts and policymakers deliberated on crucial issues related to resource adequacy, grid stability, renewable integration, and regulatory compliance, paving the way for a more resilient and sustainable power sector in India.

3.1.2. Webinar Series:

Building on the momentum of the successful Regional Capacity Building Workshops, the National Capacity Building Webinar Series was launched to further strengthen institutional capabilities within India's power sector. Held between March 21 and April 11, 2025, the series featured four webinars, each addressing key technical and regulatory themes identified by State stakeholders during earlier regional consultations. With participation from State Electricity Regulatory Commissions, utilities, renewable energy agencies, and other relevant departments, the series fostered a collaborative learning environment.

Webinar 1 – March 21, 2025: Demand forecasting (including electric vehicle demand), resource adequacy, and power procurement planning across various terms. Led by Ms. Ammi Toppo (Chief Engineer, CEA).

Webinars 2,3,4 and High-level – to be held between April 4 – May 19, 2025.

3.2 Capacity Building Workshop for Future-Ready Managers of NTPC

IRADe, in collaboration with the Central Electricity Authority (CEA), organised a series of Three-Day Capacity Building Program (29th to 31st January, 2025) aimed at equipping future ready managers with the knowledge and skills required to navigate evolving policies, regulations and technologies. With rapid advancements in sustainable energy, electric mobility, energy storage, and market mechanisms, it is imperative that managers and senior officials in the power sector stay ahead of industry trends. This program was designed specifically for managers and senior officials at NTPC, in consultation with senior NTPC officers, and was held at the NTPC Power Management Institute, Noida.

The Workshop covered key topics such as Sustainable Energy Transition Goals, Net Zero Policies, Virtual Power Plants, Renewable Energy and Storage Obligations, and emerging regulations like General Network Access, New Grid Code 2023, Tariff Regulations (2024-29), Security-Constrained Economic Dispatch and Contracts for Differences. Participants gained insights into flexible thermal operations, cross-border electricity trade, e-mobility strategies and micro-grid business models, enabling them to contribute effectively to India's energy transition.

By engaging industry leaders, regulatory experts, and policymakers, the program ensured a comprehensive learning experience, bridging the gap between policy formulation and implementation.

Supported by: National Thermal Power Corporation Limited (NTPC)

4 Sustainable Urban Development

4.1 Policy Intervention for Enhancing Effectiveness of Heat Early Warning Systems

Heat waves are a silent killer. The frequency and intensity of heat waves is rising substantially in India and more so in Indian cities. Heat Early warning issued by Indian Meteorology Department (IMD) only takes into account maximum temperature (Tmax). However, the declaration of heat waves just on the basis of Max temperature (Tmax) has serious drawbacks given that relative humidity intensifies heat stress combined with high temperatures. The combined impact of high temperature and humidity leads to much higher heat stress compared to high temperature alone. Given the surge in humid heat levels in India, it is important to factor humidity and provide heat index based early warnings. In absence of policy on heat index based early warning, India is at risk of silent sufferings and preventable deaths. However, there is no heat index unique to India to address the limitations of the existing heat index developed internationally.

IRADe in collaboration with the IMD, Ministry of Earth Sciences, Government of India is piloting a methodology to design and develop heat index for Indian climate conditions. Two pilot locations have been selected for pilot - Balasore, which is coastal city in Odhisha and Varanasi, a riverine city in Uttar Pradesh. The project will capture localised temperature and humidity data in indoor and outdoor environments in slums, alongside its impacts on low income groups living in slums. The methodology and detailed questionnaires for vulnerability analysis and daily heat impact assessment questionnaires for inputs for design of heat index has been developed and tested. The project localities and households have been selected based on socio-economic profile, housing characteristics, economic activities, access to infrastructure services, water, sanitation, and hygiene (WASH). The field pilots for the vulnerability assessment and primary surveys for informing heat thresholds will be done in May-June, 2025. This project will generate an India-specific understanding of humid heat impacts on low-income groups and the identification of heat index thresholds based on local conditions, and will strengthen IMD's impact-based forecasting by enhancing the development of a localised Heat Index. The adoption of heat index in heat action plans will help to improve policy response for heat and protect low-income communities through better preparedness and adaptation measures.

Analysis of the heat waves between 2011 and 2024 was done covering frequency, intensity, geographic distribution, and impacts of heat waves at regional, state and district level in India. The study highlighted there is sharp surge in number of heat wave events in 20024. India faced highest 554 incidences of heat waves in 2024 compared to 179 in 2023. North Indian region was the most

impacted region and North East Region was least impacted region. Odisha was worst impacted state by the heatwaves in 2024, followed by Uttar Pradesh and West Bengal. The distribution of heat wave conditions in various states of India are presented in Map

Figure 5: Number of Heatwave Days Reported 2011-2024

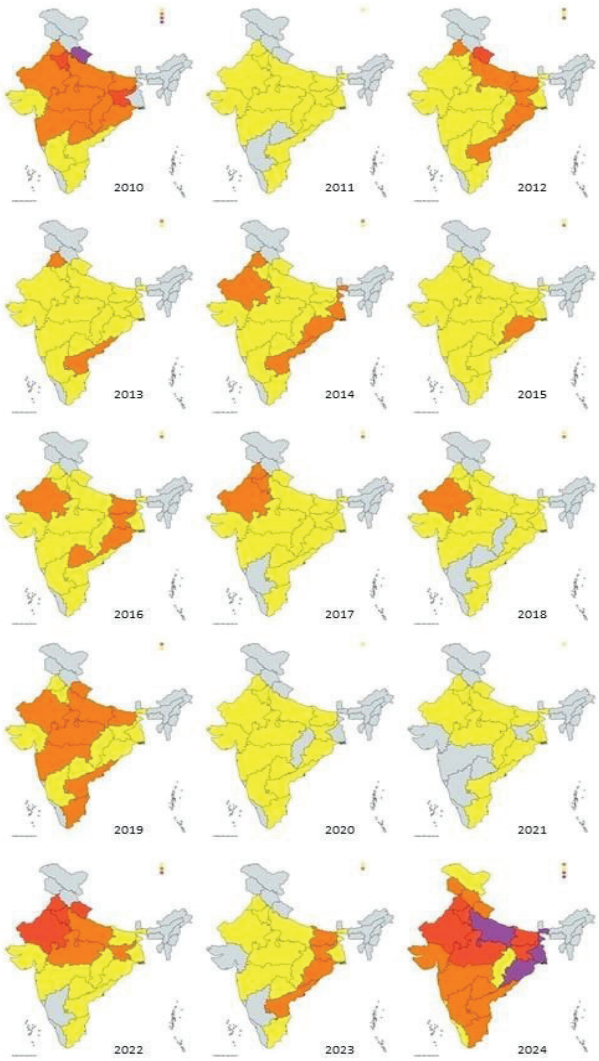
Source: IRADe Analysis

IRADe researchers conducting primary surveys in Varanasi.

1. There is need to expedite development, implementation and financing of heat mitigation and adaptation strategies for the states to reduce negative impacts of heat waves in India.

Supported by: International Sustainable Energy Foundation (ISEF)

Map 1: Heatwave Days across states of India (2010-2024)



Yellow <=10 days.
Orange between 10 and 20 days.
Red between 20 and 30 days.
Violet > 30 days.

Note: Developed by IRADe

5 Spotlight

5.1 Celebrating IRADe's 22nd Foundation Day

On 5th September 2024, we celebrated IRADe's 22nd Foundation Day, marking another milestone in our ongoing journey towards a sustainable and resilient future. The celebration gave us the opportunity to reflect on the impactful projects, partnerships, and achievements that have shaped our vision for a greener planet. Watch IRADe documentary, which showcases our work in crucial areas such as energy transitions, climate resilience, and sustainable development.

youtube link: https://www.youtube.comwatch?v=AtQKH4k7f08&t=674s

5.2 COP29, Baku, Azerbaijan

Side Event - IRADe in collaboration with the Walker Institute, University of Reading, organised the side event titled Shared Risks, Shared Solutions on 14th November, 2024 at Baku, Azerbaijan

The side event was attended by scientists, policymakers, civil society, and non-state actors, who reflected on the transboundary climate risks in the South Asia and Middle East regions. The session highlighted the importance of transboundary cooperation and presented specific cases to accelerate cooperative adaptation actions and policy making.

5.3 Festschrift Release Event: "Practical Economic Analysis and Computation"

IRADe proudly hosted the release of ***Practical Economic Analysis and Computation: A Festschrift in Honor of Professor Kirit Parikh*** on 5th March 2025 at the India International Centre (IIC), New Delhi. The event brought together eminent economists, policymakers, and academicians to celebrate Prof. Parikh's exceptional contributions to economic analysis, computation, and policy research.

Published by **Springer Nature,** the book features contemporary essays by leading experts across sectors including energy, climate change, agriculture, water resources, and public health. The volume underscores the relevance of quantitative tools such as statistical models and computation techniques in shaping

effective and sustainable policy solutions, particularly in developing economies. The studies address topics such as renewable energy integration, cross-border electricity trade, natural resource management, and macroeconomic modelling.

The book was formally launched by **Shri Suman Bery,** Vice Chairman, NITI Aayog, who delivered an inspiring keynote on the role of economic modeling in policy decision-making.

Dr. Probal Ghosh, Deputy Director, IRADe, welcomed the guests and emphasized the value of this publication in advancing computational research in policy domains.

The event featured engaging insights from distinguished contributors including **Dr. Surjit Bhalla, Dr. Michiel Keyzer, Dr. Mahendra Dev, Dr. Basanta Pradhan, Dr. Ashima Goyal, Dr. Badri Narayanan, Dr. Ganesh Kumar, and Dr. Suresh Velangapudi,** who highlighted the importance of data-driven policymaking and future-ready economic thinking.

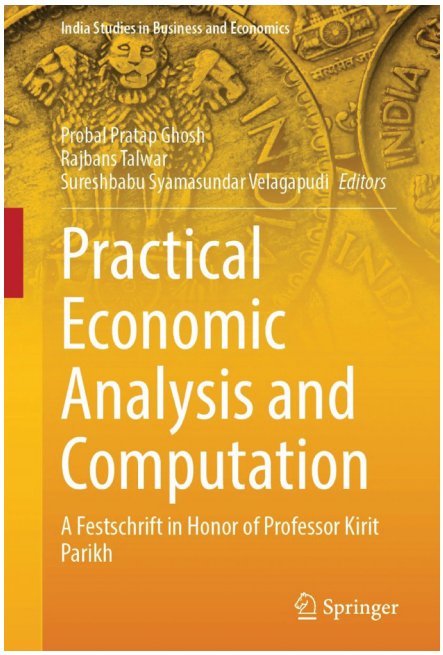
Prof. Kirit Parikh, Chairman, IRADe, expressed heartfelt gratitude for the honour and reflected on the evolving nature of policy research. **Dr. Jyoti Parikh,** Executive Director, IRADe, reiterated the institute's commitment to evidence-based and multidisciplinary policy analysis.

The event concluded with a vote of thanks by **Mr. Rajbans Talwar,** Optimization Consultant, STEAGE Energy Services.

The release function created a rich platform for knowledge exchange and reaffirmed the importance of analytical research in driving inclusive and sustainable development.

The studies bring into focus the latest developments in climate change, the switch to renewable energy sources, and the public health crisis due to COVID-19. This collection will be of great value to policymakers and researchers, especially from a developing economy perspective.

Read more on the book's homepage on SpringerLink: https://link.springer.com/book/9789819767526



6 Collaborations in 2024-25

6.1. IRADe and Central Electricity Authority (CEA), Ministry of Power

IRADe has signed a Memorandum of Understanding (MoU) with the CEA focusing on "Cooperation for the development of a Sustainable Power Sector in India and South Asia in the realm of Just Energy Transition on 30 May 2024. The MoU was signed by Mr. Rakesh Kumar, Secretary, CEA, and Prof. Jyoti Parikh, Executive Director, IRADe, in the presence of Mr. Ghanshyam Prasad, Chairperson, CEA, Mr. Jeevan Kumar Jethani, Director, MNRE, and Mr. Pankaj Batra, Senior Advisor, IRADe. The collaboration aims to lead a sustainable energy transition, ensuring equitable and environmentally conscious energy practices that foster socio-economic development in the region.

6.2. IRADe and CERCA, IIT Delhi

IRADe and Arun Duggal Centre of Excellence for Research in Climate Change and Air Pollution (CERCA, IIT Delhi) signed a Memorandum of Understanding (MoU) to jointly work on research and action on issues related to climate change, health and environment. This partnership marks a significant step for climate change and health research, policy and action in India on 7 August 2024

The MoU was signed by Prof. Jyoti Parikh, Executive Director, IRADe and Prof. Sagnik Dey (Coordinator, CERCA), IIT Delhi in the presence of Prof. Kirit Parikh, Chairman, IRADe, Mr. Hemant Kaushal, Project Coordinator, CERCA, IIT Delhi and Mr. Rohit Magotra, Deputy Director, IRADe.

6.3. IRADe and India Meteorological Department

A Memorandum of Understanding (MoU) was signed between IRADe and the India Meteorological Department (IMD). The MoU establishes a collaborative framework to enhance the accuracy and effectiveness of early warning systems in India, with a specific focus on impact-based forecasting. Through joint research, piloting, and knowledge sharing, the collaboration seeks to improve

heat index forecasting, heat stress index methodologies, and heat action plans, while also strengthening communication channels and supporting research projects.

This partnership will facilitate capacity building, awareness, and public engagement through co-organised events, ultimately contributing to more resilient communities in India. The MoU was signed by Dr. M. Mohapatra, Director General of Meteorology, IMD and Prof. Jyoti Parikh, Executive Director, IRADe in the presence of Mr. Rohit Magotra, Deputy Director, IRADe on 30 August 2024.

6.4. IRADe and the Adaptation Research Alliance (ARA)

IRADe was inducted as a member of The Adaptation Research Alliance (ARA). This significant milestone underscores our commitment to advancing research and action on climate adaptation and resilience. As part of this global network, we will collaborate with leading organisations dedicated to strengthening the resilience of communities most vulnerable to climate change.

6.5. IRADe and Shiv Nadar University

A Memorandum of Understanding (MoU) was signed between IRADe and Shiv Nadar 'Institution of Eminence Deemed to be University' (Shiv Nadar IOE). This partnership sets the stage for joint research, capacity-building initiatives, and knowledge exchange, promoting academic excellence and innovation. The collaboration aims to leverage the strengths of both institutions, enhancing interdisciplinary learning and driving impactful research outcomes. The MoU was signed by Prof. Jyoti Parikh, Executive Director, IRADe and Dr. Suneet Tuli, Dean, Partnership and Research, Shiv Nadar IOE on 4 September 2024.

6.6. IRADe and Symbiosis International (Deemed) University

IRADe signed a Memorandum of Understanding (MoU) with Symbiosis International (Deemed) University. This partnership marks a significant step towards fostering joint research, knowledge sharing, and capacity-building, paving the way for impactful contributions in the fields of sustainable development, energy, and policy research.

The MoU was formally signed by Prof. Jyoti Parikh, Executive Director, IRADe, and Prof. Jyoti Chandiramani, Dean, Faculty of Humanities and Social Sciences & Director, Symbiosis School of Economics, at the IRADe office in the presence of senior officials on 4 February 2025.

Through this collaboration, we aim to leverage academic and research synergies to drive innovative solutions and create meaningful impact. Looking forward to a fruitful partnership!

7 Publications and Media Coverage

Journal Articles

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- Verma, M., Singh, N., & Majumdar, S. (2024). Slum rehabilitation and sustainable feminine health practices: A case study from an urban slum in India. Journal of Urban Regeneration & Renewal, 18(2), 180-193.
- Naik, B., Chandiramani, J., & Majumdar, S. (2024). Is India's higher education system a case of elusive inclusive development?. Cogent Education, 11(1), 2428874.
- Parikh, J. K., & Saini, N. (2025). The role of regional grid connectivity and cooperation for Decarbonisation: A case study of South and South East Asia. Energy for Sustainable Development, 85, 101606.
- Karnik, A., & Majumdar, S. (2025). Income diversification and bank profitability: exploring the importance of macroeconomic factors in India. International Journal of Business and Emerging Markets, 17(1), 1-25.

Book/ Festschrift

- Ghosh, P. P., Talwar, R., & Velagapudi, S. S. (2024). Practical Economic Analysis and Computation. Springer.

Book Chapters

- Parikh, J. K., & Dhananjayan, P. (2025). Engaging States to Achieve India's NDC. In Practical Economic Analysis and Computation: A Festschrift in Honor of Professor Kirit Parikh (pp. 327-347). Singapore: Springer Nature Singapore.
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- **Cleaning the Yamuna: Ganga clean-up lessons reveal challenges ahead,** Kirit Parikh, Business Standard, 18th March 2025
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- **Manmohan Singh profoundly influenced our lives and India's growth,** Kirit Parikh, Business Standard, 10th January 2025
  https://www.business-standard.com/economy/news/manmohan-singh-impact-personal-reflections-indian-economy-125011000599_1.html
- **COP29 in Baku: Climate finance takes centre stage in global talks,** Jyoti Parikh, Kirit Parikh, Business Standard, 11th November 2024
  https://www.business-standard.com/opinion/columns/cop29-in-baku-climate-finance-takes-centre-stage-in-global-talks-124111101738_1.html

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- Parikh, J. K., & Saini, N., Bridging Borders: Case for interregional power connectivity, April 30, 2024, Powerline.
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8 Professional Activities

Prof. Kirit Parikh, Chairman, IRADe

29th April 2024: Guest of Honour at the Engineering Council of India's 20th National Conference and 22nd Foundation Day. Delivered opening remarks on "Emerging Trends in Sustainable Development - Vision 2030."

25th April 2024: Guest-of-Honour at the World Petroleum Technology Congress 2024. Delivered keynote on clean energy transition in oil & gas.

10th May 2024: Speaker at virtual debate on 'India's Energy Needs to Meet Stated Economic Targets for 2035/2047,' organised by Indian Association for Energy Economics (I-AEE).

11-12 July 2024: Special address at NGV India Summit on transitioning to clean mobility and alternative fuels.

7th August 2024: Keynote speaker on LNG pricing at Bharat LNG Summit 2024.

6th August 2024: Participated in 2nd Meeting of Working Group 1 on Macroeconomic Implications of Net Zero Transitions, organised by NITI Aayog.

19th December 2024: Valedictory address at Third Biennial Conference on Development at IGIDR, Mumbai. Spoke on Inclusive Sustainable Viksit Bharat and India's pathway to Net Zero.

Prof. Jyoti Parikh, Executive Director, IRADe

12th April 2024: Panelist at 21st Annual Day of Nepal Development Research Institute (NDRI), on climate-resilient strategies.

10th June 2024: Delivered keynote at Sustainable High Energy Physics (HEP) Workshop 2024, co-organised by CERN, DESY, SLAC & Oxford University.

29th June 2024: Attended as a Distinguished Expert Resource Person for Environment Policy and Action Youth Fellowship | An Online International Summer School Program organised by IMPRI Impact and Policy Research Institute.

5th September 2024: Keynote speaker at the Gender Pavilion during the International Solar Festival 2024, by International Solar Alliance.

27th September 2024: Speaker in the panel discussion on the "Role of DISCOMs in scaling up eCooking" at the Modern Energy Cooking Forum 2024.

6th September 2024: delivered a keynote at the Gender Pavilion of the International Solar Festival 2024, organised by the International Solar Alliance

4th December 2024: Spoke on Energy Connectivity in South Asia at UNCC Bangkok during Workshop on Multilateral Cross-Border Electricity Trade.

18thDecember 2024: Delivered keynote at IGIDR's Third Biennial Conference on Development on global energy trends.

14th January 2025: Spoke at Climate Tech Convening 2025 organised by EDF, CNBC-TV18, and Climate Collective.

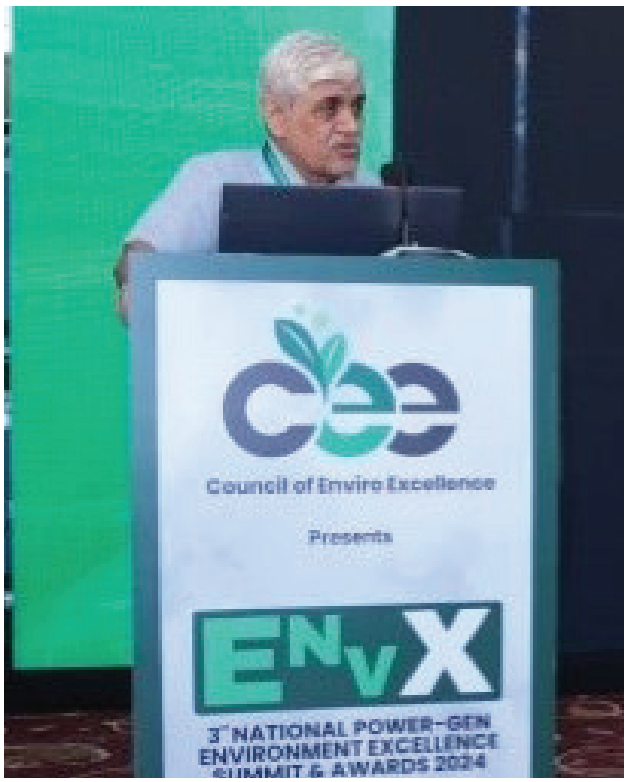
21st January 2025: Participated in Expert Group Meeting on Environment Statistics by Ministry of Statistics & Programme Implementation (MoSPI).

17th February 2025: Guest of Honour at 74th Annual Convocation of SNDT Women's University, Mumbai.

24th February 2025: Participated as distinguished senior champion at roundtable discussion "Unleashing the Role of Solar", focusing on energy access, affordability, and financing organised by International Solar Alliance (ISA), New Delhi

25th March 2025: Panelist at CoDRR-10 Workshop on "Women's Role in Disaster Risk Reduction" organised by NDMA & UN Women.

Mr. Pankaj Batra, Senior Advisor, IRADe



31st May 2024: Panelist at NTPC School of Business (NSB), shared insights on curriculum design.

26th June 2024: Delivered opening remarks at the 3rd National Power-Gen Environment Excellence Summit & Awards.

9th & 12-13th December 2024: Led the Indian delegation of BIS in the plenary meeting of IEC TC 120, Electrical Energy Storage Systems held at India Habitat Centre, New Delhi.

9th January 2025: Delivered Welcome Address at the National Power-Gen Water Summit & Awards 2025.

21st March 2025: Received the ISGF President's Award for the Best Contribution towards Energy Transition in India and the Best Contribution towards the Promotion of Clean Energy and Grid Modernization

Dr. Sudipa Majumdar, Director, IRADe

13th May 2024: Presented paper at Emerging Research Paradigms in Business and Social Sciences (ERPBSS) Conference, Middlesex University Dubai, on SHGs and Sustainable Livelihoods.

21st February 2025: Inducted as External Expert, Board of Studies, Faculty of Humanities and Social Sciences, Symbiosis International University.

26-29 September 2024: Presented research on Medical Value Travel at S-TEAM Conference, Symbiosis International University Pune.

22-24 October 2024: Completed 3-day Certification on "Impact Evaluation of Development Programmes" by Campbell South Asia & Institute for Human Development.

11th March 2025: Panelist at UKRI's "Celebrating Women in Science" event, British High Commission.

19th March 2025: Participated in roundtable on Women in Modern Energy Cooking organised by MECS and Finovista.

Mr. Rohit Magotra, Deputy Director, IRADe

7th June 2024: Guest speaker at SIOM Nashik's MBA (Agri OM) batch on social entrepreneurship.

2nd July 2024: Panelist at WRI's Global REHOUSE Convening on planning tools in urban resilience.

11th September 2024: Expert at consultative meeting on Urban Heat Management Handbook for Global South.

7-8 November 2024: Panelist at Asian Development Bank gender-responsive heat planning workshop in Cambodia

24th January 2025: Technical Expert in NDMA's Technical Committee on UNEP-CEPT Urban Heat Island Methodology.

13-14 February 2025: Technical panelist at NDMA's International Workshop on Heatwaves 2025.

12-14 February 2025: Panelist at regional consultation on Locally Led Adaptation, Kathmandu.

19th February 2025: Discussant in World Bank Group Country Partnership Framework FY 26-30 Consultation.

27th February 2025: Expert Panelist at

IIT Delhi workshop on Climate Change Adaptation & Disaster Risk Reduction.

11th March 2025: Panelist at ORF-Dasra Inception Huddle on Strategic Urban Resilience Framework for UP (SURF-UP).

Dr. Probal Ghosh, Deputy Director, IRADe

28th May 2024: Presented MESSAGEix-based power sector model results at MESSAGEix Community Meeting by IIASA.

11th – 12th July 2024: Panelist in session on CNG Economics and Pricing Volatility.

12th July 2024: Contributed to stakeholder consultation on energy demand estimation in transport sector by NITI Aayog.

10th July 2024: Participated in Stakeholder Consultation on India's Long-Term Low-Carbon Pathway by Shakti Foundation.

21st August 2024: Participated in IIT Delhi's discussion on critical materials for green hydrogen.

7th August 2024: Attended scenario modelling roundtable by IIM Ahmedabad.

20th September 2024: Guest lecture at MDI on policy analysis in energy and climate change.

30th January 2025: Presented final results of the analysis of air pollution mitigation from transport sector in Delhi at Final Review Meeting of APHH held on 30th January 2025 at IITM, Pune.

9 List of Projects 2024-25

S.No	Title	Funding Agency
Climate Change and Environment		
1	Assessing Energy Transition Pathways: Analysing Energy Demand for Low Carbon Interventions	International Sustainable Energy Foundation (ISEF)
2	Long-term Decarbonisation Strategies for the Indian Steel Sector with Hydrogen as One Option	Department of Science and Technology (DST), Government of India
3	Roadmap for Adoption of Zero Emission Vehicle in India	International Sustainable Energy Foundation (ISEF)
4	Pathways for Green Hydrogen Development in India	International Sustainable Energy Foundation (ISEF)
5	Assessing Fiscal Policies to Support Adoption of Technologies for a Net Zero Transition in Power Sector using an Integrated Economy-Energy Model	European Union Climate Dialogues (EUCDs)
Asia Centre for Regional Cooperation		
6	Electricity Grid Interconnection Masterplan for the BIMSTEC Region	Asian Development Bank
Energy and Power Systems		
7	Capacity Building Workshops for Future-Ready Power Sector Professionals of NTPC	National Thermal Power Corporation Limited (NTPC)
8	National Capacity Building Program for State-level Regulatory & Implementing Institutions on Resilient, Inclusive, & Environmentally Sustainable Power Sector	International Sustainable Energy Foundation (ISEF)
Sustainable Urban Development		
9	Policy Intervention for Enhancing Effectiveness of the Heat Early Warning Systems in India	International Sustainable Energy Foundation (ISEF)

10 IRADe News Letters weblinks

2025	
Vol VI | Issue 12 (Feb Mar 2025)	https://mailchi.mp/irade.org/irn-feb_march_2025
2024	
Vol V | Issue 11 (Dec 2024 Jan2025)	https://us5.campaign-archive.com/?u=45288bb8e81bf42269a033e1e&id=0c8b6db6c9
Vol V | Issue 10 (Nov 2024)	https://us5.campaign-archive.com/?u=45288bb8e81bf42269a033e1e&id=9ffce63fc2
Vol V | Issue 9 (Sep 2024)	https://us5.campaign-archive.com/?u=45288bb8e81bf42269a033e1e&id=7a240bf410
Vol V | Issue 8 (Aug 2024)	https://mailchi.mp/irade/irn-august2024-9448882
Vol V | Issue 7 (Jul 2024)	https://mailchi.mp/irade/irn-july2024-9446982
Vol V | Issue 6 (Jun 2024)	https://mailchi.mp/irade/irn-june2024-9444766
Vol V | Issue 5 (May 2024)	https://mailchi.mp/irade/irn-april2024-9439194
Vol V | Issue 4 (Apr 2024)	https://mailchi.mp/irade/irn-april2024

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