

# ANNUAL REPORT



### **Current Governing Council - IRADe**



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Prof. Jyoti K. Parikh, PhD Executive Director, IRADe



**Dr Suresh Prabhu** Former Union Minister of Railways



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Prof. Jyoti K. Parikh, PhD Executive Director, IRADe



# **About IRADe**



carrying out policy research and its implementation for enabling socioeconomic growth and charting pathways for sustainable development in South-Asia.

IRADe was established under the Society's Act, in 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. In addition, it provides expertise to other ministries, national and international institutions, and partners with other reputed organisations.

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### **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 multidisciplinary perspectives for decision-makers in the thematic areas of climate change and environment; energy and power systems; sustainable urban development; agriculture and food security; poverty alleviation and gender, using policy research and analysis, consensus building and dialogues, capacity building, monitoring and evaluation.

# **Our Objectives**



# IRADe's activities in the above areas have cross-cutting themes such as technology assessment and policy reforms. The key activities are:

- 1. Policy Dialogues and Dissemination
- 2. Training and Capacity Building
- 3. Research and Analysis for Decision Support
- 4. Research in Action, Monitoring and Evaluation of Projects



(IRADe's 20th Foundation Day, September 5, 2002)

# Preface



This 20th anniversary year turned out to be a landmark year with a number of achievements. **First, the highest number of projects and also in terms of gross receipts.** Second, IRADe completed the SARI/EI/USAID project on South Asia Regional Cooperation for Energy Integration after 10 years with a bang, where this year alone up to September 30, we did 35 major events and many study reports were brought out. The program closed with a grand closing event "Looking Back to Move Forward". Third, the MacArthur Foundation project on state-level climate mitigation to achieve national goals of reaching 50% renewable capacity focused on Gujarat, Odisha, and Assam. Fourth, our work on Net zero emission pathways for India's power system was completed and published in a journal.

While these were being completed, IRADe received four new projects from the Asian Development Bank (ADB), two on the Sustainable Energy Transition of the South Asia region and the role of regional connectivity in progressing towards natural gas substitution and economic benefits of the regional connectivity including Myanmar. The other two went beyond to address the grid connectivity of the South Asia region to the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) and the South East Asia (SEA) region.

Our action project on Distributed Renewable Energy (DRE) also ended with workshops in Bihar and Jharkhand on solarising schools, the idea supported by the Education and Power communities. In communication, IRADe participated in COP27 where two events were for the UNFCCC and one for the Ministry of Environment (MOEFCC), Government of India.

Altogether this year, IRADe organised 35 events out of which **two major closing events can be seen on the cover page.** We also began activities in Hydrogen technology analysis with the Department of Science & Technology (DST) and electric vehicles supported by the Shakti Sustainable Energy Foundation. We would be grateful for your feedback on our work and this report. I thank Rohit Magotra, Arushi Bajaj, Ananya Bhatia and all IRADe group coordinators for their contribution in bringing out this Annual Report. I convey my best wishes to the readers.

Jupiti Parile

**Jyoti Parikh** On behalf of Team IRADe

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IRADe has, from the start, accorded tremendous importance to the energy and power systems arena. Increased access to affordable and clean energy can play an important role in improving the quality of life of people and in addressing the huge challenge posed by Climate Change. IRADe undertook several initiatives in the year 2022-23 that included assessing the likely time frame by which India's largely fossil fuel-dominated power sector could become carbon neutral, besides starting work on a roadmap for adoption of Zero-emissions vehicles (ZEV) in India.

# 3.1.1. Assessing potential carbon neutrality target years for India's power sector

This study assessed technology options and pathways to achieve Net Zero emissions in the Indian Power Sector in the years 2050 and 2060 and its economic implications. Primary project outcomes are a set of feasible technology options for the Indian Power Sector, consistent with its geographical, technological, political, and socio-economic situations, and a road map for the development and implementation of the Net Zero pathway along with investment and energy supply cost implications. Using the data of the IRADe's Indian power system model of hourly supply potential across the months of the year for each alternative generation technology and demand variation hour by hour across months. An intertemporal optimal technology choice model is solved using the MESSAGE software of International Atomic Energy Agency (IAEA). Demand and supply are balanced each hour ensuring requirements of both generation capacity and energy are met. A stakeholder engagement workshop has been organised to present and discuss the project findings. Project outcomes also have been presented

in various forums and meetings. The final report has been submitted to the funding agency.

**Supported by:** New Venture Fund, USA **Duration:** 1<sup>st</sup> May, 2021 to 31<sup>st</sup> July, 2022

# 3 1.2 Roadmap for Adoption of Zero Emission Vehicle in India

Internal Combustion Engine (ICE) vehicles form the bulk of the vehicle stock on India's roads today and are major contributors to road transport emissions and urban air pollution. ICEs have an established manufacturing and market demand in India. To reduce air pollution and emissions, Zero Emission Vehicles (ZEV) need to be promoted. Many countries across the world have come up with policies and timelines to reduce sales of ICEs and to promote ZEVs. Roadmap of policies for adoption of ZEVs in India is required. IRADe will develop a national transport model which projects a time-table for segment-wise adoption of ZEVs and assess the impact of such an adoption on the economy. The project would aim to review policies that can support adoption of ZEVs in each vehicle segment through a road transport model and illustrate the impacts on the economy of such a policy. The study will also look into ICE supply chain linkages and stakeholder engagement through bottom up approaches to suggest policy framework for Just transition. The perspectives of impacts of the transition on the key stakeholders will be assessed through multi stakeholder engagement. The project will suggest enabling policies for sustainable and just transition for the auto sector.

**Supported by:** ISEF, Shakti Sustainable Energy Foundation

Duration: 1st Nov 2022 to 31st Oct 2024



# 1.3 Long-term Decarbonisation Strategies for the Indian Steel Sector with Hydrogen as One Option

This study is about developing long-term decarbonisation strategies for the Indian steel industry, a hard-to-abate sector, with hydrogen as one option. Expected key outcomes from the project include -

- Estimates of hydrogen demand potential (2020-2060) for the Indian steel industry;
- Hydrogen supply infrastructure requirement;
- Investment needed for transition (hydrogen and steel infrastructure); and so on.

The current status of Indian steel industry has been reviewed and documented. Review of various steel demand projection based on published sources and demand projection using IRADe Macro-economic model was done. Techno-economic assessment of four electrolyser technologies were carried out and Levelised cost of Green Hydrogen production has been estimated for these electrolyser technologies Further, various low/no carbon steel production technologies and modelling Indian steel industry using MESSAGE model will be used to develop least cost low carbon pathways. Two workshops have been organised, one kick-off and another one to present and discuss the preliminary results.

Supported by: Department of Science and Technology (DST), Government of India Duration: April 2022 to September 2023

# 1.4 Integrated strategy, policies and measures for green hydrogen development

Green Hydrogen produced by electrolysis of water using electricity from renewable sources, is expected to play an important role in energy transition, reducing carbon footprints for the hard-to-abate sectors, and providing flexibility to the electricity system dominated with intermittent sources. Green hydrogen from cheap renewable energy sources may also offer export possibilities to otherwise heavily energy import dependent India. Solar and wind together would have a high share in capacity of the low carbon Indian power system. Sunshine or strong wind may cause over-supply of electricity in low demand period. Instead of curtailment, in addition to charging battery, excess electricity also could be used to produce green hydrogen for electricity when there is no sunshine or wind, or other purposes like reducing carbon footprint of the hard-to-abate sectors (fertiliser, steel) or even export. Applying modelling and scenario analysis, study will assess green hydrogen production and investment potential of the Indian power system, strategies for its optimal economic use (end-use sectors, power system flexibility, export) and also review incentives and measures.

**Supported by:** ISEF, Shakti Sustainable Energy Foundation

Duration: March 2023 to December 2023

# 1.5 Supporting development of an economy wide low-carbon development pathway for India

Under the India Climate Energy Modelling forum of the NITI Aayog, IRADe initiated work to develop energyeconomy pathways and evaluate their implications to achieve net zero for India by 2070 and alternative time frames. The project aims to identify feasible options for India's revised NDCs for 2030 consistent with the net zero trajectory, estimate socio-economic impacts on GDP growth, per capita income, poverty, and trade patterns involved in these trajectories and finally to estimate evaluate the year-wise quantum of incremental investments, technology transfer needs, and endogenous technology development needed for these pathways. The project goal is to assess a net zero pathways path for India adopting clean technologies in various sectors through adoption of clean technologies in various sectors by using a combination of macroeconomic and sectoral models. In particular, the power sector, transport sector and industry sector would need to be assessed in detail. Therefore, the project proposes to use a combination of IRADe's Macroeconomic model, IRADe's Power Systems model and IRADe's Transport model to estimate a net zero pathway by 2070 for India.

**Supported by:** ISEF, Shakti Sustainable Energy Foundation

Duration: March 1, 2023 to December 31, 2023



# Asia Centre for Sustainable Development

The 10-year project titled 'South Asia Regional Initiative for Energy Integration (SARI/EI)' that IRADe had been engaged in with USAID as a partner concluded in the financial year 2022-23. Subsequently, UK AID funded modelling work for BBIN region. ADB funded transmission and energy studies strengthened IRADE's hold on the topic. The financial year 2022-23 saw the Centre start work on a study to determine how to bolster sub-regional energy cooperation among South Asian countries, besides continuing ongoing work related to grid studies. IRADe also engaged with the stakeholders to deliberate on a roadmap to achieve Climate-resilient inclusive growth in Asia without following a high carbon pathway. Details of the work and progress made by the Asia Centre for Sustainable Development during the financial year 2022-23 are provided below.

# SARI regional grid connectivity

# 2.1 South Asian Regional Initiative for Energy Integration (SARI/EI), USAID

IRADe put in place the enabling ecosystem for enhanced regional energy integration and greater cross border energy trade among south Asian countries, especially between Bangladesh, Bhutan, India, and Nepal (BBIN). SARI/EI program, began at IRADe in 2012 covering eight countries of Afghanistan, Bangladesh, Bhutan, India, The Maldives, Nepal, Pakistan and Sri Lanka. The second phase, continued with IRADe as a partner of USAID, to further the earlier objectives i.e. advancing regional energy integration and increasing Cross Border Electricity Trade. The second phase is described below. During the IRADe first phase, a consensus was built and the BBIN countries have increased their electricity trade. Further, in the second phase of IRADe, the focus was on implementation. A number of strategy papers were developed with a focus on implementation, each with senior representatives of South Asian countries. This was followed by many events.

# 2.1.1 Second Edition of BIMSTEC Energy Outlook 2035

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The Bay of Bengal Initiative for Multi Sectoral Technical and Economic Cooperation (BIMSTEC) Energy Outlook 2035 was published. This report will act as a reference point for the stakeholders and provides a long-term forecast i.e. 2020-2035, for overall energy usage in the BIMSTEC region comprising



seven Member States (Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka and Thailand) along with energy transition patterns at the individual country level. Key energy parameters considered include final energy consumption, electricity demand, electricity sales, electricity mix, and cross border electricity trade (CBET). While the outlook is developed under a base case, an alternate case is also estimated, considering a high Electric Vehicle and Renewable Energy scenario.

2.1.2 Creating a Regional Technical Institution/Body for cross-cutting deliberations and promoting excellence towards the development and operation of the regional transmission network in South Asia (SAFTU - Southern Regional Initiative for Energy Integration)

The South Asian countries have accelerated CBET through transmission interconnections. In the Eastern region, CBET is undertaken between India, Bangladesh, Bhutan and Nepal. The overall electricity



trade is estimated to be over 20,000 billion units. Multiple cross border transmission interconnections exist different between the countries, enabling crossborder electricity trade to a significant quantum. At present, all such trade to at bilateral level between



the two adjacent countries, though in time to come interconnections between two distant countries, passing through the network of an inter-mediatory country is also likely. This study developed a strategy paper for creation of a Regional Technical Institution (RTI) / body of transmission utilities in South Asian countries, which may act as a platform for cross cutting deliberations and promoting excellence in the field of integrated regional transmission network in the region.

2.1.3 Creating Regional Network for sharing operational best practices and promoting harmonisation & excellence in Power System Operation across South Asia Region (SAFSO – South Asia Forum of System Operators)

The study developed a detailed strategy for creating а regional network for power system operators and practitioners to share knowledge, exchange ideas. discuss best practices, collaborate and form consensus on the issues of common interest and build capabilities in



this area. The proposed network would be advisory in nature and would aspire to collectively leverage the experience and technical know-how of power system operators in South Asian Countries (SACs). It is envisaged to be an association of the entities dealing with the subject of power system operation and control, with voluntary participation by member countries. The study examines the key elements of an organisation's structure to identify the best suited option for the proposed network. It is proposed that the network would be advisory in nature and would aspire to collectively leverage the experience and technical know-how of power system operators in the South Asian Countries.

# 2.1.4 Creating the South Asia Forum for Electricity Market (SAFEM) for promoting Cross-Border Electricity Trade (CBET)

The South Asian countries have distinct economic profiles and energy consumption patterns. On account of resource complementarities, demand diversity, seasonal demand variation, differentials in cost of power and potential synergies integration for the



and grid balancing, there exists significant potential of undertaking cross border power trade to ensure the overall socio-economic development of the region. The regional power trade, which is to the tune of about ~3900 MW, is currently mostly through bilateral mechanisms, confined to Bhutan-India, India-Bangladesh, and India-Nepal. Such power trades are mainly negotiated between the Governments through long-term Power Purchase Agreements and few medium/short term agreements. But there are also trades through calling for competitive bidding in these trades. A gradual transition from bilateral to trilateral and multilateral forms of trade, and to switch more towards commercial and market-based mechanisms of power trade, require regional electricity market development. To facilitate this, a regional forum is deemed critical. Against this background the strategy paper provided a detailed background for the creation of SAFEM, assessing international experiences for formation of such forums, analysing the current institutions present in South Asia and suggesting the proposed role, functions, institutional framework and operational roadmap for SAFEM. An informal Forum for consensus building is initially envisaged. The findings of the report were disseminated to the stakeholders in April 2022.

# 2.1.5 Transition of bilateral power trade to trilateral and multilateral power trade in South Asia

The South Asia region is taking concrete steps in moving towards Cross Border Trilateral and Multilateral Power Trade (CBTMPT). Due to the immense diversity that exists among the South Asian nations, trilateral and multilateral power trade has the potential to accrue more benefits in terms of higher trade volumes, lower installed capacity and optimisation of investment cost, lesser reserve capacity due to sharing of reserves, reduced CO2 emissions and overall regional cost optimization & economies of scale. India's Guidelines for Import/Export (Cross Border) of electricity-2018 opens up avenues for trilateral trade. Many regions across the globe have experience of transitioning from bilateral to trilateral and multilateral power trade. The study documents and analyses the international best practices in Trilateral and Multilateral Power Trade to identify learning and inferences for South Asia with the aim of developing a Regional Framework for South Asia. Based on these learnings, as well as taking in to account the conditions prevailing in different countries in the South Asia, a Regional Framework for Trilateral and Multilateral Power Trade (RFTMPT) has been developed for the South Asia Region.

# 2.1.6 Assessment of the Cross Border Natural Gas Trading (CBNGT) Potential in the South Asian Countries

The study shows that while there would be growth in demand for gas due to enablers viz. policies, investments and economic benefits, the domestic production is declining in India, Bangladesh and Pakistan, and the dependence on LNG imports is likely to increase. Natural gas is a cleaner and cheaper option as compared to liquid fuels, such as petrol, HighSpeed Diesel (HSD), Furnace Oil (FO), etc. Post the recent COP26 summit at Glasgow, the majority of the world's economies (US, UK, France) have set a target to achieve Net Zero Emissions (NZE) by 2050 while India and China have committed to



achieve NZE by 2070 and 2060 respectively. With these targets being set at national levels, gas can help the countries in their energy transition to cleaner fuels and help decarbonise the world economy. The Cross Border Natural Gas Trade potential was assessed by reviewing and analysing the existing long-term Demand-Supply (D-S) projections, till 2040, including sectoral projections, considering associated policy and regulatory environment of the natural gas sector. The study suggests the details of the gas infrastructure required across the natural gas value chain, under various scenarios, along with the investment requirements and a regional roadmap and an action plan for initiating/accelerating the Cross Border Natural Gas Trade (CBNGT) in the South Asian Countries.

2.1.7 South Asia Energy/Electricity Regulations to develop Regulatory Road Map for Electricity/Energy Exchange and Energy Cooperation (EC) among South Asian Countries

The objective of the SAFIR Working Group was to work towards enhancing cooperation regulatory to facilitate knowledge sharing, addressing cross cutting energy/ electricity regulatory capacity issues and building in South Asia and, to facilitate reduce facilitating a transparent



regulatory framework and promoting investment in the energy sector in the South Asia Region. The



study on South Asia energy/electricity regulations to develop a regulatory Road Map for Electricity/Energy exchange and Energy Cooperation (EC) in South Asia was conducted by SARI/EI for the SAFIR Working Group. SARI/EI has done a comprehensive study, reviewing and analyzing the policies/laws/regulations on cross border electricity trade prevailing in each SA country including international experience. SARI/EI came up with common minimum harmonised and standardised template of energy/electricity regulations for Electricity/Energy exchange, cross border electricity/energy trade and Energy Cooperation (EC) in South Asia. A comprehensive Regulatory Roadmap (regional and country wise) for countries of South Asia, along with country specific action plans, a detailed statement of reason and an explanatory memorandum was brought out.

# 2.1.8 Strategy Paper on Creation of South Asia Forum on Energy Investment (SAFEI) to Promote Regional Energy Investment

South Asian countries have diverse energy sources with an estimated combined hydro potential of 350 GW and an enormous quantum of wind, solar and other such resources. Harnessing this clean energy potential can accelerate development in each



study is mark possile by the generalis support of the American people through the United Same Agency for national Development (USAD)

of the South Asian Countries (SACs) and the region. Unfortunately, many of these countries are unable to cannot harness the energy potential due to want of investment capital, lack of access to technology and absence of robust institutional framework for project development and operations. South Asia is one of the fastest growing regions in the world. It is projected that it will require US\$ 1390 billion of investments from 2015-2040 to add approximately 750 GW of electricity generation capacity. Under such conditions, the involvement of private sector and multi-lateral financing agencies assumes significance and if engaged favorably, can contribute immensely in meeting some of these challenges and accelerate the whole process of energy investment. A SARI/EI report on Regional Investment Framework and Guidelines for Promoting Investment in South Asian Power Sector and Cross-Border Electricity Trade in South Asia, had proposed to create a Regional Investment Facilitation Forum, named 'South Asia Forum on Energy Investments (SAFEI)'. Such a platform can support in determining the needs/ opportunities for regional investment, identification of projects, mobilising of the funds, addressing the policy, legal and regulatory gaps, wherever they persist, to successful completion of the project, so that each member nation/ contributing partners may be able to share the benefits of the consequent investment.

# 2.1.9 Assessing the Potential Benefits of Cross Border Electricity Trade for Affordable Supply of Electricity, Facilitating Grid Balancing of Renewable Energy Integration and Suggesting a Framework for Ancillary Service Market in the South Asia Region

The role of regional hydropower in renewable integration and grid balancing require balancing generation on a regional basis. A study on 'Benefits of Cross Border Electricity Trade - Potential Optimum Utilisation and Reduction in Cost of Supply', was carried out at the behest of the SAFIR Working Group, as was mandated at the SAFIR 15th Executive Committee Meeting (ECM) and 24th Steering Committee Meeting (SCM). This study aims to review and analyse the load and generation patterns in all neighbouring countries and study the season-wise trade/ barter of power between the countries to ensure 24x7 supply to all countries and optimum utilisation of generation assets, including quantification of benefits for all countries as per the approved scope of work. The study aims to address these issues for the next 15 years, on a yearly basis, and for the 25th year, considering the rapid expansion in renewable energy in the South Asian region to reduce carbon emissions. The cost of balancing for each country on a standalone basis and combined South Asia basis was calculated. Thus, the benefits of regional grid balancing were quantified, keeping in view the net fluctuations of demand and variable renewable energy. A comprehensive and detailed modelling exercise has been carried out for likely capacity addition and different scenarios of capacity addition.

**Supported by:** USAID, India **Duration:** 1<sup>st</sup> October 2018 to 30<sup>th</sup> September 2022

# 2.2 Study on economic benefits of regional cooperation in electricity in the SASEC region

A study on Economic Analysis derived from regional cooperation in electricity in the SASEC region commissioned by Asian Development Bank (ADB) assessed the economic benefits of CBET in the SASEC region. For this study, IRADe has expanded its BBIN model developed under SARI/EI and updated under EEG to include Power system models for Sri Lanka and Myanmar. IRADe team also developed country economic models for Sri Lanka, Bhutan and Myanmar in addition to the India, Nepal and Bangladesh models used in the USAID-SARI project. IRADe team also developed a standalone power systems model for Sri Lanka and Myanmar and the process of integration with the BBIN model to create an integrated SASEC power systems model for modelling electricity trade in the SASEC region. The study showed the benefits extend far beyond the power sector and can help to achieve higher economic growth and achieve decarbonisation at the same time.

**Supported by:** Asian Development Bank (ADB) **Duration:** 1<sup>st</sup> March 2022 to 30<sup>th</sup> September 2023

# 2.3 Technical Transmission Interconnection Studies and Economic Benefits of Interconnection between South Asia and South East Asia

The Study on Transmission Interconnections in the SASEC region focused on the development and expansion of existing transmission infrastructure in the region to facilitate electricity trade. IRADe assessed the prospects and possibilities for transmission interconnections within the SASEC that includes Bangladesh, Bhutan, India, Nepal (BBIN) and Maldives, Sri Lanka, and Myanmar (MSM). Moreover, the prospects of further outreach to the South East Asian region were also explored, which are connected among themselves currently by some transmission infrastructure backed by some agreements. Various scenarios of IRADe

model provided hourly and seasonal trade levels for these countries for each country for a number of years. On the basis of the results, potential interconnection lines, keeping the maximum and minimum trade possibilities, and a robust range of transfers were identified together, to include Power system models for Sri Lanka and Myanmar. Thus, the SASEC's interconnection with South-East Asia through Myanmar were also examined in this study. There are immediate benefits because both the regional systems are in high growth phase and could reach 5,000 Twh levels with sufficient renewable energy resources. Both regions increase production at less costs and carbon emissions.

**Supported by:** Asian Development Bank (ADB) **Duration:** 01<sup>st</sup> Mar 2022 to September 2023

# 2.4 Economic Impacts and Roadmap of Replacing Natural Gas with Renewable Energy in the SASEC Region

India, Bangladesh and Myanmar have an operational Natural gas infrastructure and import LNG. Prior to the economic crisis, Sri Lanka was at an advanced stage of introducing imported LNG in its energy supply mix. The excess hydro potentials of Nepal and Bhutan could be exploited to enhance their national revenue through energy exports while helping neighbouring countries like India and Bangladesh to replace their gas-based electricity generation. The Asian Development Bank (ADB) recognises the need for a well-sequenced plan for decarbonisation and financing in the region. Natural gas can provide flexible resources to allow more renewable energy to be integrated into the grid. However, concerns have also been raised about whether the continued use of natural gas is compatible with climate stabilisation goals. This study initiated by ADB and undertaken by IRADe focuses on the existing/potential natural gas use in the SASEC region. It aims to explore the economic, environmental and climate change benefits of replacing natural gas with renewable electricity sourced domestically or imported from the region and prepare a roadmap. Regional connectivity is a better solution than gas to support renewables.

**Supported by:** Asian Development Bank (ADB) **Duration:** 26<sup>th</sup> October 2022 to 30<sup>th</sup> September 2023



# 2.5 Electricity Grid Interconnection Masterplan for the BIMSTEC Region

IRADe has been commissioned by ADB for the preparation of an electricity grid interconnection masterplan for the BIMSTEC (Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand comprise the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation) region. The proposed work is to estimate the trading potential and, based on the same, to provide an optimal transmission plan for grid interconnections for the BIMSTEC region between and across the member states, in order to facilitate feasible trade. This will examine the policies and regulations for cross border electricity trade and for clean energy transition in each country. It will also examine the existing national and cross border transmission system and that is planned until 2040. It will set out a vision to add new interconnections and/or strengthen the regional grid interconnections, both between the countries and within each of the countries, to enhance the regional energy cooperation and attract investment to make it a reality.

**Supported by:** Asian Development Bank (ADB) **Duration:** 01<sup>st</sup> November 2022 to 31<sup>st</sup> March 2024

# 2.6 Regional Consultation on Strengthening Climate Resilient Low Carbon & Inclusive Growth in Asia Region

Climate Resilient Low Carbon Strategies combine strategies to deal with climate risks and action to reduce carbon emissions, focusing on improving social, economic, health, and livelihoods. There is a need for analysing and deliberating on the pathways required to achieve Net Zero commitments for the countries in the region and regional approaches to achieve climate commitments and sustainable, inclusive economic growth. IRADe worked on a landscaping report and convened a consultation with key regional stakeholders, policymakers, and researchers to deliberate on the pathways and priorities to achieve climate-resilient inclusive development in the background of Net Zero commitments.

Some of the key priorities which emerged from the project are:

- Building resilience to climate change depends on the preparedness to deal with the issues of the shock, including financial, technological, and societal resources. Multi-stakeholder, multisectoral arrangement is essential to manage the climate change and shape the development process in the region.
- Communities are central in addressing the climate resilience, low carbon and inclusive growth and there is a need to identify potential force multipliers in the region. Community based organisations like cooperatives have huge potential for inclusive and sustainable development.
- Regional connectivity, technology, and private sector involvement are critical to developing sustainable renewable energy. Regional cooperation on energy transition, regional grid system, and multi-lateral water arrangements will build capacity of the nations.
- Cleaner production, circular economy, renewable resolution, and sustainability can help mitigate risks of climate change, biodiversity loss and pollution.

**Supported by:** International Development Research Centre (IDRC), Asia **Duration:** 01<sup>st</sup> May 2022 to 30<sup>th</sup> August 2022



# Climate Change and Environment

We participated at the COP27 Summit in Egypt; prepared a detailed Policy Brief on Climate-compatible growth in connection with the global talks on the Climate issue. We are also working on how heat action plans could be integrated into the Climate policies model guidelines and preparing gender-sensitive heat adaptation plans in south Asian cities. We are evolving long-term decarbonisation strategies for the Indian steel sector with hydrogen as an option. Details of our work in the Climate Change and Environment thematic area are provided below:

# 3.1 Enabling State Level Strategic Actions for Achieving Nationally Determined Contributions (NDC)

The team analysed three sectors (Power, Irrigation and Transport) and three representative state studies (Gujarat, Odisha and Assam) to explore the opportunities and barriers to rapid deployment of renewable power by the States with suitable central government support through market-based solutions and viable business models.

# 3.1.1 Power Sector

Many states have substantial renewable energy potential, but this needs to be harnessed swiftly with coordination and cooperation among the central and state governments. Energy policy needs to be aligned with energy availability, energy security, climate change and environmental concerns. It needs to be recognised that:

- Generation companies will set up plants if they get a guaranteed market-based mechanism for recovering costs. The DISCOMs need a commercially sound basis to buy RE and fulfil the RPO with suitable accountability mechanisms.
- Transmission utilities (along with DISCOMS) also have a very important role; they have to set up transmission lines to exploit RE, for

which financially viable mechanisms have to be implemented as a part of the policy. The government has a green corridor scheme for this, under which concerted efforts and adequate investment is required.

- RE-related goals can only be achieved smoothly and cost-effectively in an efficient and financially sound power sector operating at best practice normative operating standards and minimising and recovering the supply cost. Towards this end, the high level of T&D and theft/commercial losses of the distribution utilities need to be addressed through technical solutions like fused cables and pre-paid metering, individual and institutional incentives and accountability mechanisms, and institutional change/transformation. It must be recognised that these inefficiencies and waste add to the carbon emission footprint of the power sector.
- Above all, coordinated efforts of the centre and State governments, aimed at ensuring financial viability, are required to encourage the private sector to ensure accelerated growth of RE.

# 3.1.2 Transport Sector

The study across the three states looked at the penetration of electric vehicles (EVs), the share of public transport, energy efficiency and scrappage policy and the accompanying cost of infrastructure and investment requirements for low carbon pathways in the transport sector of these states. It also looked into incentives for lowering the cost of EVs and proposed market-based policy recommendations that may be implemented at the state level to benefit all stakeholders. A short gist of the impact of various policies on the reduction in emissions in the road sector in Gujarat is shown below. Based on the above kind of analysis for Gujarat, Odisha and Assam, the research recommended five strategies for decarbonisation of



the transport sector in these representative states. The five strategies considered and policy interventions and market measures to implement them are summarised below.

- Energy efficiency: Increasing Energy efficiency through enhancing emissions and fuel standards, vehicle rating and variable registration fees for promoting efficient vehicles and retiring of old vehicles and thereby improving fleet efficiency.
- Modal Shift: Effecting a shift in modal choice of passenger transport by an increase in public transport infrastructure, improved bus ride experience, last mile connectivity, reduction in private vehicles by imposing taxes and introduction of air pollution markets and parking market and for freight encouraging shift from road to rail through multimodal terminals.
- Introduction of Electric Vehicles: Addressing issues with EV adoption like range, high capital cost, availability of parking and charging facilities, electricity pricing policy by DISCOMs, repurchase of old non-EV vehicles and replacing with EVs and finally through electrification of public transport.
- Alternative fuels: Introduction of blended petrol, diesel to reduce emissions and pollution from road transport in the short run.

Incentivisation/ Disincentivisation policies:

- Direct market measures such as the use of fiscal instruments like additional subsidies by state governments for electric vehicles, subsidies, and financial support for metro and public buses to make them affordable to people.
- Disincentives ownership and use of private cars by imposing additional taxes on private cars and more taxes on polluting private cars.
- Indirect market measures like the introduction of green vehicles rating program along with variable registration fees, introduction of air pollution markets and parking markets and longterm policies to improve design of urban cities to reduce travel needs.

### **3.1.3 Agriculture Sector**

IRADe considered solar irrigation in the three states carrying out survey and analysis. Replacing diesel and electric water pumps with solar pumps will provide cheap and reliable energy for farmers to run a water pump during the daytime. This may have potentially adverse impacts on groundwater, scaling up of heavily subsidised schemes to large beneficiaries, the possibility of elite capture the heavily subsidised scheme, and exclusion of the poor. The probable business model for grid tied solar water pumps and its implication for the stakeholders are discussed below.

- No capital subsidy, no energy buy-back: This would have slow uptake of solar pumps, subsidy bill for grid power will continue to be high; solar farmers will be under pressure to recover investment by selling water, and only resource-rich farmers will go solar. This option will take off only if grid power subsidies are abolished or grid power supply is allowed to deteriorate so much that farmers begin to look for the solar alternative as solar would be commercially cheaper than other available alternative diesel. But this will have a very high political cost.
- 95 percent capital cost subsidy, no buyback: Uptake will be fast; grid subsidy bill will come down to the extent that solar pumps are given in lieu of grid-connected pumps; pressure on groundwater will be high; rich and poor both will solarise unless the policy suffers elite capture.
- 60 percent capital subsidy and electricity buy-back at Rs 3.5: Uptake will be fast; grid power subsidy will decline over time; the scheme will moderately incentivise energy-water conservation; the water market would harden somewhat; rich and poor both will participate.
- 15 percent capital subsidy and buy back at Rs ٢ 5.75/kWh for 25 years: This will be very good for groundwater conservation; it will also be very good for DISCOMs and government since the payout is spread over a long period and inflation will moderate it as years go by. However, the uptake will be slow because smallest farmers will find it hard to invest Rs 3.5 lakh upfront for a 10 kWp solar tubewell. So the poor will tend to be hit both ways: tubewell owner small farmers will find it hard to solarise; and water buyers will have to pay a much higher water price. The pro-poor impact of this option will be strengthened by: [a] offering a priority sector loan to small farmers to solarise; and/or [b] provide higher capital cost subsidy (say 25%) to smaller than 7.5 HP tube wells. This can

help realise the Government of India's objective of doubling farm incomes: after all, paying farmers a decent price for the energy they produce is an effective way of increasing their incomes. A national workshop was organised to disseminate and take forward the learnings from the state-level studies carried out by team IRADe.

**Supported by:** MacArthur Foundation USA **Duration:** September 2018 to September 2022

# 3.2 Study for Research, capacity building and promotion of Locally-Led Adaptation (LLA)

IRADe was commissioned by Global Centre on Adaptation, Netherlands to contribute case study on "Heat Stress, the Silent Killer in Indian Cities".

The case study highlighted the impact of Heat Stress on Health, Productivity and Livelihoods of the vulnerable population. Heat waves are a silent killer, particularly in Indian cities, where they are responsible for more deaths than any other natural disaster.

Heat stress is exacerbated by the urban heat island effect and the urban poor are more exposed to heat stress because of infrastructure scanty and insufficient coping mechanisms. Heat Action Plans that target their needs are urgently needed. The case study



was featured in Global Center on Adaptation' Stories of Resilience Publication which was launched at the COP27's Resilience Hub on 14th November 2022 at Sharm El Sheikh, Egypt.

**Supported by:** ICCCAD/ Global Commission on Adaptation (GCA)

Duration: 1st July 2022 to 30th September 2022



# Sustainable Urban Development



# 3 4.1 Integrating heat action plans in climate policy & guidelines for evolving gender-sensitive heat adaptation plans in cities in South Asia

IRADe collaborated with the city municipal corporations of Colombo (Sri Lanka), Rajshahi (Bangladesh) & Surat (India) to develop climate adaptive and gender integrated heat action plans. Mapping of urban heat islands in the project cities was



done by conducting field surveys to assess the impact

of heat stress on livelihoods, health and productivity. IRADe identified specific factors contributing to the vulnerability of the project cities. A detailed framework for gender integrated heat action plans (HAP) was developed. A training module for developing HAP was also developed in English which was translated into local languages - Bangla and Sinhalese for capacity building of the local stakeholders. The project engaged with the key decision makers/policy-makers and stakeholders to evolve and disseminate knowledge and build the capacity of the stakeholders for designing spatially differentiated and gender sensitive HAPs. The project also supported the project cities in developing the capacity of the city administration, increase awareness and knowledge among policymakers and communication to the stakeholders.

Supported by: Asia-Pacific Network for Global Change Research Duration: October 2021 to September 2023

# 3 4.2 Process Analysis, observations and modelling – Integrated solutions for cleaner air for Delhi (PROMOTE)

In the past, IRADe had reported developing the Road transport model for Delhi and modelled several mitigation scenarios like modal shift from private to public, electric vehicles adoption, energy efficiency improvement and scrappage policy. To build on the policy analysis done earlier IRADe team computed the transport system cost for each scenario for comparison of the effectiveness each mitigation strategy in reducing air pollution in Delhi. IRADe team also reviewed air pollution mitigation strategies for various polluting sectors such as transport, industries relocation and long distant pollutants.

IRADe worked on computing the cost of each road transport scenario. The transport system costs

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computed include the cost of rolling stock and its supporting infrastructure. Both are based on the allocation of lifetime cost.

The sum of the rolling stock and infrastructure costs under each of the scenarios for the different years provide an indication of the relative costs to be incurred.

The below graph shows that the cost of road infrastructure for Delhi is on the lower side as it does not have any state highways and rural roads and in addition to that the road infrastructure is nearly utilised to its full potential. The cost of each scenario is majorly the cost of rolling stock. The Integrated scenario with minimum on-road vehicles has the least cost around INR 227 billion and the scenario with maximum number of new vehicles i.e., Scrappage to a new electric vehicle is the most expensive with INR 280 billion.

**Supported by:** Ministry of Earth Sciences, Govt of India **Duration:** 01<sup>st</sup> May 2018 to 30<sup>th</sup> September 2022



Graph 1: The cost of road infrastructure for Delhi



# Poverty Alleviation and Gender

In this area IRADe focuses on Sustainable Development Goals (SDGs). SDG7 affordable clean energy solutions for all and SDG3 education for all have been addressed this year. Alleviating poverty, removing gender bias that gender especially for disadvantaged economic backgrounds have been key focus areas for IRADe from the beginning. In line with this aim, IRADe undertook a detailed study to explore how the use of DRE (Distributed Renewable Energy) technologies at government schools in three districts of Bihar could ensure consistent, seamless, guality education delivery at these institutions where students from all economic backgrounds (including those from economically weaker sections) study. The findings of our study were later shared with all key stakeholders in Bihar, including senior government officials, to obtain stakeholder buy-in for the use of DRE technologies at government schools in the state.

# 5.1 Role of Decentralised Renewable Energy (DRE) Technology in Promoting Quality School Education

The study focused on identifying ways to scale up DRE uptake in government-run schools of Jharkhand and Bihar to promote quality education covering 45 schools in 3 districts in each state. The study utilised a multi-stage sample design technique. Three districts were selected from Bihar for intensive study and data collection. State capital district Patna was selected to serve as the benchmark district. NITI Aayog has launched an aspirational district program to expeditiously improve the socio-economic status of 117 districts across 28 states The recommendations/suggestions from the analysis are categorised under four broad groups (institutional, operational, system design, and business model).

## a) Institutional Framework

A policy framework to integrate solar PV into school buildings, both for improving efficiency and educational purposes, must be supported with political will and commitment. Local people should be trained to provide routine maintenance and timely repair. Evaluation of system costs based only on initial cost discourages the choice of RE sources. Instead, one should take a long-term view. Energy supply (excess) to the grid can generate income to support school operating expenses. However, meeting school energy requirements, especially during grid load shading, should assume high priority while designing the system.



Field pictures from project schools of Jharkhand

# **b) Operational Support**

Lack of maintenance is common and leads to system failure. Regular maintenance should be ensured by the installing company or by a third party. Lack of installation standards of acceptance leads to system failure. Schools are often unaware of solar power systems' proper operation, care, or limitations. Metering is often not understood or is confusing. Training must be thorough and ongoing. There is often a lack of spare parts available in the local market. Supply should be strengthened and systems should be supplied as simple and complete as possible. Pilot projects must be replicable, use proven technologies, must be of a manageable scale for those implementing them, and must be monitored and evaluated before implementation of full-scale projects.

# c) System Design

Lack of procurement standards leads to confusion on the part of suppliers and often results in the least cost,

least robust option. Although higher energy efficiency results in lower costs, simplicity in system maintenance should also be considered. Energy systems should be integrated with end-use applications and must be the least expensive, highest benefit option to meet the school system's needs. Sophisticated electronics may be vulnerable to damage and should be avoided as much as possible.

# d) Business Model

The fact that schools are often located in remote, poorly accessible areas suggests that the technical designs for RE systems should be simple, robust, and easy to maintain; this should constitute an overriding system selection criteria. The third party needs to provide support to set up a system in the school building. A DISCOM-centric business model could be worked out for school solarisation.

**Supported by:** New Venture Fund, USA **Duration:** 01<sup>st</sup> December 2021 to 31<sup>st</sup> March 2023



Field pictures from project schools of Bihar



# Conferences, Workshops and Meetings

# **Energy and Power Systems**

## **SARI/EI – IRADe Events**

#### 6.1 South Asian Parliamentary Roundtable on Regional Energy Cooperation, 7th April 2022

A round table on South Asian Parliamentary Roundtable on Regional Energy Cooperation was hosted by the SARI/ El Secretariat at IRADe and co-hosted by Climate Parliament in hybrid mode, on the 7th of April, 2022, with the South Asian Parliamentarians, USAID India senior management, the SARI/El team at IRADe, and the local Climate Parliament team



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participating in person, and the overseas Climate Parliament team participating virtually. This round table had representation from honourable parliamentarians from the member countries and from Climate Parliament, USAID and SARI secretariat of IRADe. The round table discussed the way forward for creating a regional parliamentary forum for energy cooperation. The esteemed member of the round table were - Dr Sanjay Jaiswal, MP & Chairman Climate Parliament, India; Mr Rajiv Pratap Rudy, MP, President, Climate Parliament; Mr Nicolas Dunlop, Secretary General, Climate Parliament; Members of Parliament, Mr. Nahim Razzaq and Mr. Tanvir Shakil Joy from Bangladesh; Mr. J C Alawathuwala and Mr. Wasantha Yapabandara from Sri Lanka; Dr. Bimala Paudyal and Mr. Surendra Pandey from Nepal; Mr. Vincent Pala, Ms. Rajani Patil and Dr. Amee Yajnik from India; Mr. Gyem Dorji and Mr. Ugyen Tshering from Bhutan; Dr. Kirit Parikh, Chairman, IRADe; Dr. Jyoti Parikh, Executive Director, IRADe; Mr. Pankaj Batra, Project Director, SARI/EI, IRADe; Ms. Karen Klimowski, Acting Mission Director, USAID/India and Mr. Mukul Sharma, Asia Director, Climate Parliament.

# 6.2 Release of White Paper on 'Regional Parliamentary Forum on Energy Cooperation & Energy Trade in South Asia', 26th April 2022

A webinar was conducted to release the whitepaper on "Regional Parliamentary Forum on Energy Cooperation & Energy Trade in South Asia". Held virtually on 26th April 2022, in collaboration with CUTS International, the event was graced by Mr. Rajiv Pratap Rudy, Member of Parliament and Former Civil Aviation Minister, India; and parliamentarians from Bangladesh, Bhutan, India, Nepal and Sri Lanka. Mr. Rudy commented that Members of Parliament can play a critical role when it comes to syncing these and creating a coalition with South Asian countries.

# 6.3 Two-week training program with Power System Operation Corporation (POSOCO), 18th to 29th April 2022, New Delhi

A two-week training program on 'Power System Modelling and Simulation' was organised jointly with the National Grid operator POSOCO from 18th to 29th April 2022 in New Delhi, India. The training program was attended by participants from Bangladesh, Bhutan, India, Nepal and Sri Lanka. Sh. Alok Kumar, Secretary (Power) inaugurated the workshop in presence of Sh. S.R. Narasimhan, CMD POSOCO; Sh. RV Shahi, Chairman, SAGE – RIS; Sh. John Smith-Sreen, Director, Indo-Pacific Office, USAID; Ms. Monali Zeya Hazra, Regional Energy and Clean Energy Specialist,

IPO, USAID/India; IRADe was represented by Dr.Jyoti Parikh, Mr.PankajBatra and Mr. Vinod Kumar Aggarwal, Sh. R.K. Porwal, Head NRLDC (Program Director), and Sh. Kirit Parikh, Chairman IRADe, along with officials from POSOCO. The program was



delivered by engineers from POSOCO and included self-assessment tests on major functional areas covered in the course followed by interactive sessions with senior executives and industry experts. The participants got an opportunity of field visits to world's first multi terminal HVDC station at Agra. Power System Modelling and Simulation training program was designed to familiarise participants from the basics to advanced level of power system. This course had theory as well as hands-on sessions on power system, per unit system, modelling of power system elements, steady state load flow studies, fault analysis, dynamic modelling and simulations, reactive power studies, transfer capability assessment and optimal power flow.

#### 6.4 Report Release of "Strategy Paper On Creation of South Asian Forum On Energy Markets (SAFEM)", 19th April 2022

A webinar was organised to release the Strategy Paper on the creation of SAFEM, prepared under USAID's SARI/ El program. SAFEM will facilitate the development and creation of a regional electricity market. It will also help in the adoption and implementation of guidelines and policies, market products and market rules, by advising the South Asian countries on power trade and markets in the region. The webinar had Special Addresses by Shri P.K. Pujari, Chairperson, Central Electricity Regulatory Commission, and Shri R.V. Shahi, Former Secretary, Ministry of Power, India, Senior Advisor, World Bank & Chairman of the South Asia Group on Energy. The findings of the report were disseminated in the presence of energy enthusiasts from across the globe.

#### 6.5 28th Meeting of SAFIR SCM at India Habitat Centre, New Delhi on 8th June, 2022

Project Director, IRADe, under the SARI/EI program, attended the 28th Meeting of SAFIR Steering Committee Meeting (SCM) at India Habitat Centre, New Delhi on 8th June, 2022, and presented the work being done by the SAFIR Working Group for SAFIR.

#### 6.6 Seminar on Cross-Border Energy Trade and Regional Energy Cooperation under South Asia Think Tank Forum, 14-15 July 2022

South Asia Think Tank Forum (TTF) for regional energy cooperation was founded in the year 2016 as an outreach and dissemination forum. TTF engages policymakers, media, parliamentarians and bureaucrats, civil society and citizens to prioritise, fast-track and push the agenda for CBET. SARI/EI program and NTPC School of Business (NSB), conducted a two-day seminar on 14-15 July, 2022 under the South Asia Think



Tank Forum (TTF). The TTF acts as an outreach and dissemination forum to prioritise, fast track and push the agenda for cross border electricity trade. Through this event, the eight-month activities of TTF phase-II in India culminated in the Seminar in the presence of ministers, senior power-sector officials, researchers and media. A national-level study on the topic - "Cross-Border Energy Trade (CBET) and regional cooperation in South Asia" was released by Chief Guest, Hon'ble Minister of State for Power and Heavy Industries, Shri Krishan Pal Gurjar and other dignitaries.



#### 6.7 South Asia TTF Seminar on Cross-Border Energy Trade in Nepal, 21-22 July 2022

A seminar was held by IRADe and Nepal Energy Foundation in Nepal on 21-22 July. The event was graced by Hon'ble Member, National Planning Commission; Secretary, Ministry of Energy, Water Resources, and Irrigation; Secretary, Water and Energy Commission Secretariat, and other senior dignitaries. Day-1 of the South Asia TTF Seminar in Nepal was attended by policymakers, thought leaders, industry delegates. Day-2 had a youth session with students from Kathmandu University presenting their views on the socio-economic benefits of cross border energy trade and renewable energy transition. Media



fellows under the program shared their site visit experiences as well as their perspective on CBET and regional energy cooperation.

#### 6.8 Think Tank Forum Seminars, 10-11 August 2022 in Thimphu, Bhutan

The inaugural two-day Seminar in Thimphu was organised by the Think Tank Partner, Institute of Happiness, at the Royal Thimphu, Bhutan, the University of Bhutan on 10-11 August 2022. The Chief Guest at the event was LyonphoLoknath Sharma, Hon'ble Minister of Economic Affairs.

#### 6.9 Think Tank Forum seminars, 21-22 September 2022 in Dhaka, Bangladesh

Bangladesh Enterprise Institute, the Think Tank partner from Bangladesh, organised the seminar at Hotel Lakeshore in Dhaka on 21-22 September. Ms. Dhaka, Bangladesh Waseqa Aysha Khan, Hon'ble Member of Parliament was the chief guest at the event.

#### 6.10 Training of South Asian Regulators, 22nd Aug to 9th Sep 2022

A capacity building program was organised by the SARI/ El team at IRADe, through GETRI (Gujarat Energy Training & Research Institute) at Vadodara in India, for the national regulators of South Asia for three weeks, from 22nd August to 9th September 2022 in three modules. The three Modules covered in the three weeks were 1. Planning, Operation and Integration of Power System 2. Tariff and Licensing, and 3.

Power Exchange and Trading. The training program was inaugurated by the Director (Finance) of GUVNL (Gujarat UrjaVikas Nigam Ltd.) Shri Ravi Shanakar. 45 participants were trained by expert practitioners, followed by a site visit to the Sardar Sarovar Dam.

#### 6.11 Enhancing Cross Border Power Trade in South Asia, August 29, 2022, New Delhi

IRADe, in collaboration with RIS (Research Information System for Developing countries), organised a seminar on "Enhancing Cross Border Power Trade in South Asia" on 29 August 2022 at Silver Oak, India Habitat Centre, New Delhi. The focus areas of discussion during the seminar included Cross Border Electricity Trade, the role of policy and regulation, infrastructure and power markets, and regional institutions in enhancing trade.



The seminar was inaugurated by Shri. Alok Kumar, Secrettary, Ministry of Power, Government of India and attended by Secretary Power, Government of Nepal among other dignitaries.







#### 6.12 Task Force Meeting 30th August, 2022 and PSC Meeting 1st September, 2022

The combined Task Force meeting of the SARI/EI Program was held on the 30th August and the Program Steering Committee (PSC) meeting on the 1st September, 2022, with a Study Tour of the +/- 800 kV HVDC and 765 kV AC substations in Agra, the substation that handles the maximum quantum of power in India, on 31st August 2022 for the members of both the PSC and the Task Forces. The activities undertaken since the last PSC and combined Task Force meeting and the activities in progress were presented before the members, and suggestions for studies and events were sought from them.

#### 6.13 Think Tank Forum Regional Conference, 14th September 2022

The Regional South Asia Think Tank Forum (TTF) Conference of the SARI/EI Program was held on 14th September 2022 to conclude the Think Tank Forum Program, engaging with five countries in South Asia viz. Bangladesh, Bhutan, India, Nepal and Sri Lanka. The Inaugural Session was graced by H.E. Dr. Shankar Prasad Sharma, Hon'ble High Commissioner to India Nepal, Ms. Veena Reddy, Mission Director, USAID, Dr. Jyoti Parikh, Executive Director, IRADe, Mr. Pankaj Batra, Project



Director, SARI/EI – IRADe and Ms. Sonali Zeya Hazra, Regional Energy Manager and Clean Energy Specialist, Indo Pacific Office, USAID/India. A film on The Journey and Way Forward of Think Tank Forum was showcased.

#### 6.14 SARI/EI Closing Conference - Looking Back to Move Forward, 15-16 September 2022, New Delhi

To celebrate the journey of the SARI/EI program and its transition to USAID's South Asia Regional Energy Partnership (SAREP), a Regional Conference, "Looking Back to Move Forward: 22 years of regional energy cooperation and integration", was organised on 15th -16th September at Hotel Lalit in New Delhi by SARI-EI/ IRADe and United States Energy Association (USEA). The Keynote Address was given by the Chief Guest, Ms. Meenakshi Lekhi, Hon'ble Minister of State for External Affairs. Technical Sessions on Cross-Border



Energy Trade (CBET) for Enabling Clean Energy Transition, Power of Data, South Asian Regional Power Market– Enabling Environment, CBET – A Way Towards Energy Security, What's Next for the Energy Sector? - Global Hot Topics were held. The regional conference brought together 90-plus South Asian stakeholders and international experts to celebrate the many successes, share lessons learned, and deliberate on important themes such as the role of cross-border power trade in the clean energy transition, regional power markets in South Asia, power of data, and some emerging technologies and issues in the energy sector.

#### 6.15 Stakeholders roundtable on SAFEI on 26th September 2022

A Roundtable for discussions on "Creation of a Forum on Energy Investments in South Asia (SAFEI) for promoting regional energy investments" was held on 26th September 2022, at the Le Meridien Hotel, in New Delhi. The Roundtable dealt with different aspects of Regional Energy Investment, i.e. "Regional Energy Investment and Financing", "Regional Infrastructure – Sector-wise Perspective", and "Institutional Mechanism".





#### 6.16 4th SAFIR Working Group Meeting (Virtual) on 12th September 2022

Project Director, IRADe, under the SARI/EI program, organised the 4th Meeting (Virtual) of the SAFIR Working Group in virtual mode, on 12th September 2022, where the launch of the South Asia Energy Database Portal, updating of the Regulatory Compendium and progress of the SAFIR Quarterly Newsletter, as well as ongoing studies and proposed training were presented and comments sought from the members.

#### 6.17 8th Meeting of the Joint Working Group of SAFIR "To Study, Formulate and Recommend for Facilitating Power Trade Development in South Asia"

Project Director, IRADe, under the SARI/EI program, attended the 8th Meeting of the Joint Working Group of SAFIR "To Study, Formulate and Recommend for Facilitating Power Trade Development in South Asia", where he presented the final version of the Draft Common Minimum Grid Code for South Asia, after detailed discussion with all stakeholders, ad incorporating their comments. The few issues of differences were presented for discussion and decision. The decisions were given and subsequently the final version has been sent to the SAFIR Secretariat for further action.

#### 6.18 Training and Study Tour May 7 to May 18, in three European countries viz. France, Belgium and Germany

**SARI/EI Study Tour:** Advancing Energy Security through Renewable Energy Integration and Regional Power Markets May 7 to May 18. The SARI/EI Secretariat at IRADe, along with USEA (United States Energy Association), formulated a 10-day Study Tour Program to three European countries, with institutions involved in cross border electricity trade in Europe, as well as renewable integration into the grid, viz. France, Belgium and Germany. A high-level delegation from Bhutan, Bangladesh, India, Nepal and Sri Lanka was taken by the SARI/EI, USAID and USEA representatives to these countries. The goal of this study tour was to promote



cross-border electricity trade and renewable energy integration in South Asia through identifying European frameworks and practices that can be adopted in the Region.

### **Sustainable Urban Development**

#### 6.19 7th Master Class on "Role of City Planning in The Mitigation of Extreme Heat", 27th April 2022

The Master Class by Dr. Rajashree Kotharkar, Professor, Department of Architecture and Planning, Visvesvaraya National Institute of Technology (VNIT), Nagpur, deliberated on the impact of Extreme Heat in the Cities and on the role of planning in the mitigation of Extreme Heat. The presentation also covered the application of Local Climate Zone (LCZ) Classification and LCZ based Urban Heat Island mitigation strategies. The Masterclass was attended by 90 plus participants from urban policy makers, researchers, urban planners and students.

#### 6.20 8th Master Class on "Heat Stress Mitigation and Adaptation Perspective South Africa" 20th May 2022

Conducted by expert Dr. Adriaanvan der Walt, Senior Lecturer, Department of Geography, University of Free State, South Africa, on 20th May 2022, the Master class deliberated on the existing heatwave scenario in South Africa, adaptation measures, and mitigation policies to cope with heatwaves. Dr Walt elaborated on the impacts of high temperatures and their consequent impact on the people, especially the vulnerable sections of society, such as the young and old population. He described the consequent pressure it creates on the city's infrastructure. The session discussed the government's policy interventions and measures at the city level that aims to build its adaptation and mitigation capacity.

#### 6.21 Stakeholder Consultation on the "Developing Gender Sensitive Heat Action Plan for the Surat", Gujarat, 10th October 2022

The consultation was organised by the Urban Health and Climate Resilience Centre of Excellence (UHCRC Surat) and IRADe on 10th October, 2022 under the Asia-Pacific Network for Global Change Research (APN) Project on "Gender-Sensitive Heat Action Plans in Cities of South Asia". Dr. Ashish Naik, Deputy Commissioner (Health and Hospital),



Surat Municipal Corporation (SMC), & Honorary Secretary UHCRCE delivered the inaugural remarks. 35 participants attended the workshop, including the senior and mid-level officers from various departments of the SMC viz; Health, Fire and Emergency Services, Environment Engineering, Smart City, Town planning, Garden, Hydraulic, Community Medicine, Affordable Housing; Resident Medical Officers (RMO) from Surat Municipal Institute of Medical Education and Research SMC Hospital; Professors from Sarvajanik College of Engineering and Technology, Government Medical College, Center for Social Studies, Navsari Agricultural University Surat.

#### 6.22 Stakeholder Consultation on Developing Gender-Sensitive Heat Action Plan for Rajshahi, Bangladesh, 19th October 2022- Dhaka/New Delhi

The consultation was organised by the International Centre for Climate Change and Development, Dhaka and IRADe, Delhi, on 19th October 2022 under the Asia-Pacific Network for Global Change Research (APN) Project on "Gender-Sensitive Heat Action Plans in Cities of South Asia". The workshop deliberated on key adaptation measures to be adopted for developing and implementing the Gender Sensitive Heat Action Plans for the city.



### **Climate Change and Environment**

#### 6.23 National Policy Dialogue: Enabling State Level Strategic Actions for Achieving NDC Goals, 6th September, 2022

IRADe organised a national workshop aimed at disseminating and taking forward the learnings from the studies done by IRADe to identify strategies for time-bound further reduction in carbon emissions in three energy-intensive sectors namely power, transport and irrigation, related specifically to the areas of power generation, transportation, and pump based minor



irrigation. The workshop brought together high-ranking State and Central government officials and a broad range of other key stakeholders. Dr. Jyoti Parikh, Executive Director, IRADe, delivered the welcome address to flag off the workshop and set the tone for the event. The Honourable Union Power Minister, Shri R.K. Singh delivered the inaugural address. The presidential address was delivered by the Honorable Union Minister of Environment, Forests and Climate Change, Shri Bhupendra Yadav. Shri Tarun Kapoor, Adviser, Prime Minister's Office (PMO), delivered a Special Address in the opening session of the workshop. The workshop brought together State, and Central level secretaries, bureaucrats, and 90-plus key stakeholders from the government think tanks, research institutes, development agencies, and civil society attended the event.



### **Asia Centre for Sustainable Development**

#### 6.24 Regional Consultation on the "Climate-Resilient Low Carbon & Inclusive Growth in Asia" 4th July 2022

A Regional Consultation was organised by IRADe and the Asia Regional Office, International Development Research Center (IDRC), Canada at India International Center (IIC) to deliberate on the pathways and priorities to achieve climateresilient inclusive development in the background of achieving Net Zero commitments in South Asia. The event was inaugurated by Prof Jyoti Parikh, Executive Director, IRADe, welcome remarks were delivered by Dr. Anindya Chatterjee, Regional Director, Asia, IDRC. The sessions were chaired by



Prof. N. Vinod Chandra Menon Founder Member, National Disaster Management Authority, India, Prof Kirit Parikh, Chairman, IRADe and Dr. J. R. Bhatt, Ministry of Environment, Forest and Climate Change, India. The special remarks were delivered by Mr. Suresh Prabhu, Former Union Minister, Govt of India. This event was attended by over 100 participants.

#### 6.25 Meeting on Long-Term Decarbonisation strategies for the Indian Steel Sector, 20th April, 2022

The Kick-off meeting for the project on "Long-term decarbonisation strategies for the Indian steel sector with hydrogen as one option" (funded by the Department of Science and Technology, Government of India) was organised on 20th April 2022. The online meeting had speakers from the Department of Science and Technology, NITI Aayog, TATA Steel and JSW Steel. IRADe presented the outline of the project, the status of the Indian steel industry and the decarbonisation strategies for the industry. A panel discussion on the challenges of decarbonisation in the Indian steel industry was held, and feedback on the project was received. Increasing the share of steel scrap in steel production, using green hydrogen for reducing iron ore in direct reduction of iron and carbon capture and storage of carbon dioxide emissions from blast furnaces emerged as the major solutions to decarbonising India's steel industry.

#### 6.26 Nepal Electric Cooking Outreach National Workshop, 12th April 2022

A Modern Energy Cooking services (MECS) Electric Cooking Outreach National Workshop was jointly hosted in Kathmandu on 12th April 2022, by MECS, IRADe, People Energy & Environment Development Association (PEEDA), Winrock International, Practical Action Consulting, and, Practical Action, to present the findings from the first large-scale, evidence-based research on electric cooking (eCooking) in Nepal. The workshop discussed opportunities and potential challenges for scaling up eCooking in Nepal, based on the findings of



IRADe's report. The report documented the findings of a 6-month pilot study by IRADe to monitor uptake and consumer experiences of Electric Pressure Cooker with 80 households (40 urban and 40 rural). Representatives from the key stakeholder groups engaged in the Nepali clean cooking sector, including Clean Cooking Alliance (Nepal), Alternative Energy Promotion Centre (GoN), local government, international and local development agencies, finance institutions, the private sector, academia, and the media.

#### 6.27 Webinar on "Discussion on Decarbonisation challenges and solutions for the Indian Steel industry", December 13, 2022

IRADe and FICCI organised a webinar on "Discussion on Decarbonisation challenges and solutions for the Indian Steel industry" on December 13, 2022. This event was a part of a project "Long-term decarbonisation strategies for the Indian steel sector with hydrogen as one option", sponsored by the Ministry of Science and Technology, the Government of India. The agenda was to discuss the preliminary findings of the project and gain feedback from the policymakers, industry experts and stakeholders. Three technical presentations were made by the IRADe research team (Dr. Anjana Das and Dr. Deepak Sharma) and Dr.Mukesh Kumar, followed by the panel discussion. Eminent panellists include Mr. Arpan Gupta, Additional Director & Head, Mines, Metals & Cement, FICCI; Dr.Mukesh Kumar, Senior Advisor, JSP Group Advisory; Mr Anurag Pandey, Hydrogen Value Chain, Reliance Industries Ltd; Mr. V R Sharma, Vice- Chairman, Jindal Steel and Power Ltd. More than 180 participants attended this webinar online and many more connected live through Facebook live.

### **Poverty Alleviation and Gender**

#### 6.28 Workshop on "Role of Solar Technology in Promoting Quality School Education in Bihar", February 1, 2023

IRADe convened a half-day regional workshop the "Role of Solar Technology in Promoting Quality School Education in Patna, Bihar on February 1, 2023. More than fifty participants representing local authorities, researchers, academic experts, and international and regional organisations were gathered to discuss regional priorities and challenges to utilising solar technology to promote quality school education in the state. In general, the workshop aimed at stimulating constructive debates on priority areas of common concern, but also a commitment to future efforts for



school solarisation by the state government and their agencies. The workshop highlighted that access to electricity at schools is important for improving the overall quality of teaching and learning experiences for both teachers and students. Electricity can facilitate multiple ICT technologies, including televisions, computers, the internet, audiotapes, projectors, printers, and copy machines. The different sessions in the workshop stressed on taking forward the discussion to constructive actionable suggestions for different stakeholders.

#### 6.29 Workshop on "Role of Solar Technology in Promoting Quality School Education in Jharkhand", 28 March 2023

IRADe organised a workshop on the role of solar technology in promoting quality school education in Ranchi on 28th March 2023. With the intent to provide energy access through renewable energy for educational facilities, the workshop addressed the Sustainable Development Goals (SDGs) such as reduction of girl child drop out from schools, improving availability of water and sanitation, helping the country to meet NDC



(Nationally Determined Contribution) goals and a step towards Net-Zero-2070. The main objectives of the workshop were to identify evidence-based opportunities and measures for the installation of DRE systems at schools to improve the teaching-learning outcome; Increase enrolment and greater interest levels across the student base due to availability of quality electricity supply, and enhance awareness regarding the Decentralised Renewable Energy (DRE) cost-benefits among the policymakers, education sector professionals, NGOs, and other stakeholders at large. The workshop suggested on policy framework to integrate solar PV into school buildings, both for improving efficiency and for educational purpose. The same must be supported with political will and ccommitment. Evaluating system costs based only upon initial cost discourages the choice for RE sources. One should take a long-term view while energy supply (excess) to grid can generate income to support school operating expenses.



### **IRADe's Participation in Important Forums and Meetings**

#### 6.30 IRADe @ UNFCCC COP 27 Sharm El Sheikh, Egypt

#### UNFCCC side event at COP27, Egypt, 8th November 2022

IRADe organised UNFCCC side event on "Addressing Heat Equity through Vulnerable community focused Heat Adaptation Plans" on 8th November 2022 on the sidelines of the UNFCCC COP 27 Sharm El Sheikh, Egypt. The session was chaired by Dr. Linda Anne Stevenson, Head of Knowledge Management and Scientific Affairs and was inaugurated by Mr. Santiago Alba Corral, the Director of IDRC's Climate-Resilient Food Systems program. Dr. Jyoti Parikh, Executive Director, IRADe highlighted that Climate Change is becoming increasingly complex and therefore actions are required at home, ward, Municipal, state, regional, National and International levels. The lead



presentation was given by Mr Rohit Magotra, Deputy Director IRADe. He focused on impacts of heat stress on vulnerable communities, heat adaptation needs and solutions to address heat equity from Global South and North

#### 6.31 Side event at India pavilion, COP27, Egypt, 10th November 2022

IRADe's India Pavilion side event on "Climate Adaptive Heat Stress Action Plans for Vulnerable Communities", was organised on 10th November 2022. Dr. Bhatt, Senior Advisor, MoEFCC, Govt. of India chaired the session and cited that extreme events are rising in frequency, duration, and impact. Because of the changing climatic regime, heat waves are rising and are likely to rise. Heat action plan is a comprehensive early warning system, and preparedness for extreme heat leads to immediate and longer-term actions to increase preparedness information sharing and response coordination to reduce the health impacts of extreme heat on vulnerable populations



and the ecosystem. Dr. Kirit Parikh, Chairman, IRADe cited extreme events make people, especially the poor, vulnerable because they often live in congested slums and have almost no coping mechanisms.

#### • IRADe's exhibit on 10th -12th November 2022

IRADe displayed an exhibit at the COP27 on Electric Vehicles from 10th -12th November . The exhibit showcased research work on EV charging patterns in Delhi & Impact of EV charging on the DISCOMs of Delhi. EVs have zero emissions compared to conventional vehicles as they do not directly emit GHGs and other air pollutants to the environment. it can play a significant role in meeting global goals on climate change. Several Project reports of IRADe thematic areas were also displayed digitally at the exhibit.

#### • NITI Aayog meeting with leading Think Tanks May 18, 2022

IRADe was invited by NITI Aayog for a strategic meeting with leading think tanks, under the Chairpersonship of Shri Suman K Bery, Vice Chairman, NITI Aayog, held on May 18, 2022. Prof Kirit S Parikh in his opening remarks, highlighted the important role that think tanks could play in shaping Government policies and importance of collaboration with them. Praising the NITI's initiative, Dr Jyoti Parikh, in her opening remarks, suggested to focus on science, technological and environmental issues into all spheres of development and research. She urged think tanks to collaborate on such issues and seek innovative solutions.

#### • Dr. Jyoti Parikh, ED, IRADe attends the UNESCAP seminar in Bangkok 13th February 2023

Professor Jyoti Parikh delivered a seminar at United Nation (ESCAP) in Bangkok, Thailand on IRADe/ ADB report on "Regional power connectivity between South and South-East Asia." The representation from the External Affairs and Energy Ministry, USAID, Delloitte and UNESCAP discussed the results which showed that power system of both the regions



would grow substantially over the next two decades and both have sizeable untapped potential of renewable energy. The connectivity offers a big opportunity for the transition to power systems with high share of renewable sources for both the regions, while reducing costs, CO2 emissions and capacity needs.

#### IRADe and ADB meet to discuss the proposed interconnections pertaining to the BIMSTEC Master Plan, Bengaluru, 28<sup>th</sup> February, 2023

Under the ADB Project awarded to IRADe on formulation of the BIMSTEC Grid Interconnection Master Plan, a physical meeting of IRADe and ADB was held with Chairperson CEA to discuss the proposed interconnections with India related to the BIMSTEC Master Plan in February 2023. The BGICC (BIMSTEC Grid Interconnection Coordination Committee) was held in Bengaluru, on 28th February, 2023, where ADB made a presentation, prepared jointly by IRADe, Manitoba Hydro International (the other consultant) and ADB, to the Committee on device were addressed followed by an orientation for the next phase of the pilot programme.



# Publications and Media Coverage

# IRADe Publications

S. No.	Project Report No. and Year	Title of Project	Funding Agency
1.	IRADe-PR-96(2022)	Enabling State Level Actions for NDC - Gujarat Transport Sector	MacArthur Foundation
2.	IRADe-PR-97(2022)	Enabling State Level Actions for NDC - Assam Transport Sector	MacArthur Foundation
3.	IRADe-PR-98(2022)	Assessing potential carbon neutrality target years for India's power sector	New Venture Fund (NVF)
4.	IRADe-PR-99(2023)	Training Manual for Developing Climate Adaptive & Gender Integrated Heat Action Plans	Asia-Pacific Network for Global Change Research
5.	IRADe-PR-100(2023)	Vulnerability Assessment of Households to Socio- Economic Impacts of Heat Stress in Rajshahi	Asia-Pacific Network for Global Change Research
6.	IRADe-PR-101(2023)	Vulnerability Assessment of Households to Socio- Economic Impacts of Heat Stress in Surat	Asia-Pacific Network for Global Change Research

# >> Journal Articles

- A Das, Saini V., Parikh K., Parikh J., Ghosh P., and Tot M., Pathways to net zero emissions for the Indian power sector, Energy Strategy Reviews, Volume 45, January 2023, 101042
- R Magotra, N Jha, (2023) Spatial-Temporal Spread of Dengue in Delhi: An Empirical Analysis, Journal of Vector Borne Diseases, DOI: 10.4103/0972-9062.361163
- Probal. P. Ghosh (2022): "Impact of India's diesel subsidy reforms and pricing policy on growth and inflation", Energy Economics, Volume 113, September 2022, 106195, (Ghaziabad)
- Nikhilesh Dharmala, Nazar Kholod, Vaibhav Chaturvedi, Probal Pratap Ghosh, Ritu Mathur, Shikha Bali, Anshuman Behera, Sakshi Chamola, Leon Clarke, Meredydd Evans, Russell Horowitz, Aakansha Jain, Poonam Nagar Koti, Anantha Lakshmi Paladugula, Sharif Qamar, Swapnil

Shekhar and Shweta Srinivasan (2022): "Win-win transportation strategies for India: Linking air pollution and climate mitigation", Energy and Climate Change, Vol-3, 100072, 2022 (https://doi. org/10.1016/j.egycc.2022.100072.)

# Article/Blogs

- Pankaj Batra "Optimizing Resources Facilitating CBET in South Asia", in the Annual Issue of Powerline magazine, on South Asia https://cloud.3dissue. com/51522/52022/232543/PLSA30February23/ index.html
- Pankaj Batra. Blog on the SARI/EI website on "How South Asia Forum of Electricity Market can create a vibrant regional power market" on 21st June 2023 https://sari-energy.org/blog-post/how-south-asiaforum-of-electricity-market-can-create-a-vibrantregional-power-market/



# **Professional Activities**



# Dr. Jyoti Parikh

 May 11<sup>th</sup>, 2022: Special invitee at the meeting with COP President organised by United Nations Framework Climate Change Conference (UNFCCC), virtual



- May 18<sup>th</sup>, 2022: Speaker on Net zero emission pathways at the meeting with leading Think Tanks' organised by Niti Aayog, New Delhi
- May 25<sup>th</sup>, 2022: Speaker at 'NGV Summit' by Messe Frankfurt Trade Fairs India Pvt Ltd, New Delhi
- Aug 3<sup>rd</sup>, 2022: Interview: How can conversations around climate policy be better supported? by Fru Bekefi, Senior Behavioural Analyst, CANVAS8, virtually
- Sep 7<sup>th</sup>, 2022: Speaker at New Statesman's "Making Sense of Net Zero" global event series by, NSMG online
- Nov 29<sup>th</sup>, 2022: Spoke at the Reception at British High Commission, on COP26 deliberations New Delhi
- Feb 4<sup>th</sup>, 2023: Speaker at TEDx IIM Ranchi Sustainable Energy Transition by IIM Ranchi, Jharkhand
- Feb 13, 2023: Speaker at Connectivity between South Asia and South-East Asia organised by UN ESCAP at Bangkok, Thailand
- Feb 23<sup>rd</sup>, 2023, Speaker at Ashoka University Model United Nation Club's event: The Table! organised by Ashoka University, virtually
- Mar 2<sup>nd,</sup> 2023: Key speaker and Panelist "MoP Draft Guidelines on Pump Storage Projects in the Country "by India Energy Storage Alliance (IESA), virtually
- Mar 8<sup>th</sup>, 2023: Attended RE vision 2023 organised by Renewable Energy Institute, virtually
- Mar 14<sup>th</sup> 15<sup>th</sup>, 2023: Speaker at International Integrated Energy Transition Conference & Exhibition organised by Energy Forum at New Delhi

# Mr Pankaj Batra

 8<sup>th</sup> July 2022: Speaker at the 8th International Conference (Virtual) on Advances in Energy Research (ICAER 2022) organised by IIT Bombay



- 12<sup>th</sup> July 2022: Chaired the 20th meeting of Power System Control and Associated Communications Sectional Committee of BIS
- 27-30 July 2022: Speaker at the International Conference on 'Global Power Sector Challenges & Mitigation
- 27<sup>th</sup> July 2022: Co-chaired the 26<sup>th</sup> meeting of Secondary Cells and Batteries Sectional Committee
- 6<sup>th</sup>-7<sup>th</sup> December 2022: Attended the 10<sup>th</sup> meeting on Energy Connectivity at the UN Conference Centre, Bangkok
- 8<sup>th</sup>-9<sup>th</sup> December 2022: Green Grids Initiative Asia-Pacific Working Groups took part in the Working Group meeting in Bangkok
- 23<sup>rd</sup> December, 2022: Moderated a session on Future Smart Grids at IIT Mumbai in the Conclave On Smart MObility Systems (COSMOS)
- 2<sup>nd</sup> March 2023: Delivered the Keynote Address at the Distributed Solar Summit 2023, held by Solar Quarter
- 2-3 March 2023: Co-moderated a session on "Systemising OSW evacuation infrastructure planning and implementation in India", under the Roadmap for Offshore Wind (OSW) Power Evacuation and Grid Integration in India, organised by the UK Government under the ASPIRE program.



### Mr. Rohit Magotra

 24<sup>th</sup> May 2022: Speaker on "Heatwave disaster Risk Reduction" webinar organised by District Disaster Management Authority, Mathura



- 10<sup>th</sup> August 2022: Presented Two papers on 'Ward Level Disaster Resilience Action Plan

   Gangtok' and 'Ward Level Climate Adaptive Heat Action Plan- Rajkot' at the "International Conference on Systems Analysis for Enabling Integrated Policy Making", organised by TIFAC & IIASA at Delhi
- 6<sup>th</sup> September 2022: Speaker at the National Workshop on 'Integrating and Strengthening Climate Action in Urban Development' organised by Development Management Institute (DMI), Patna
- 30<sup>th</sup> November, 2022: Discussant in the consultation on Evolving Development Research Landscape In Asia organised by IDRC, India International Centre, Delhi
- 14<sup>th</sup> Feb, 2023: Panelist for session on State Level Plans for Heat Wave Risk Reduction in National Workshop on Preparedness, Mitigation and Management of Heat Waves organised by National Disaster Management Authority, India at IIT Mumbai
- 24<sup>th</sup> February, 2023: Panelist in the workshop on Integrating Gender and Climate Change conversations, organised by Kubernein Initiative and WISCOMP at Indian International Centre, Delhi

### Dr. Anjana Das

7-10 June, 2022: Participated at the "Technical Meeting to Review the IAEA's Methodologies and Analytical Tools for Sustainable Energy Development", IAEA's Headquarters in Vienna, Austria.



- 10-12 August, 2022: Presented a paper on Pathways to net zero emissions for the Indian power sector: Technology options and costs, at the "International Conference on Systems Analysis for Enabling Integrated Policy Making", organised by TIFAC & IIASA in Delhi.
- 17-21October, 2022: Participated as an expert (virtual) at the Regional Training Course on Energy Data Collection, Analysis and Integrated Assessment of Climate Land Energy and Water (CLEW), held at Belize city.

### **Mr. Probal Ghosh**

August 10 - August 12, 2022: Participated at the "International Conference on Systems Analysis for Enabling Integrated Policy Making" in Delhi and presented on " Impact of EV charging on



Delhi grid in 2030 and key policies to promote and support EVs in Delhi."

- 5<sup>th</sup> September 2022: Participated in the round table on "Path to Zero: Status and Vision for Decarbonising Transport in India", organised by NITI Aayog
- 7<sup>th</sup> December 2022: Participated in the Round table discussions on Modelling Pathways for Zero Emission Transport Systems in India by WRI and supported by NITI aayog at Juniper Hall, India Habitat Centre
- 8<sup>th</sup> December 2022: Speaker at the panel discussion on "Indian Electricity Market: Role of Policy and Technology" at the workshop on "Policy for Decarbonisation of India Power Sector Together with Energy Storage" organised by TERI at the TERI, Darbari Seth Block, India Habitat Centre, Lodhi Road, New Delhi





S. No.	Title	Funding Agency	Status		
Climate Change and Environment					
1	Regional Consultation on Strengthening Climate Resilient Low Carbon & Inclusive Growth in Asia Region	International Development Research Centre, IDRC, Asia	Completed		
2	Study for Research, capacity building and promotion of Locally-Led Adaptation (LLA)	ICCCAD, Global Centre for Adaptation	Completed		
3	Long term integrated strategy, policies and measures for green hydrogen development	Department of Science and Technology (DST)	Completed		
4	Enabling State Level Strategic Actions for Achieving NDC	MacArthur Foundation	Completed		
Sustainable Urban Development					
5	Integrating heat action plans in climate policy & guidelines for evolving gender-sensitive heat adaptation plans in cities in South Asia	Asia-Pacific Network for Global Change Research	Ongoing		
6	Process Analysis, observations and modelling – Integrated solutions for cleaner air for Delhi (PROMOTE)	Ministry of Earth Sciences, Govt of India	Completed		
Asia Centre for Urban Development					
7	Technical Transmission Interconnection study–Cross Border power trading specialist	Asian Development Bank	Ongoing		
8	Study on economic analysis derived for regional cooperation in electricity in SASEC region	Asian Development Bank	Ongoing		
9	South Asian Regional Initiative for Energy Integration (SARI/EI)	United States Agency for International Development (USAID)	Completed		
10	Electricity Grid Interconnection Masterplan for the BIMSTEC Region	Asian Development Bank	Ongoing		



S. No.	Title	Funding Agency	Status		
11	Economic Impacts and Roadmap of Replacing Natural Gas with Renewable Energy in the SASEC Region	Asian Development Bank	Ongoing		
	Energy and Power Systems				
12	Study on South Asia Sub Regional Economic Cooperation Regional Energy Cooperation.	Asian Development Bank	Ongoing		
13	Assessing potential carbon neutrality target years for India's power sector.	New Venture Fund by Shakti Foundation Shakti Sustainable Energy Foundation	Completed		
14	Roadmap for ZEV Adoption in India	ISEF, Shakti Sustainable Energy Foundation	Ongoing		
15	Integrated Strategy for Green Hydrogen Development in India"	ISEF, Shakti Sustainable Energy Foundation	Ongoing		
16	Supporting development of an economy wide low- carbon development pathway for India	ISEF, Shakti Sustainable Energy Foundation	Completed		
Poverty Alleviation and Gender					
17	Role of DRE Technology in Promoting Quality School Education.	ISEF, Shakti Sustainable Energy Foundation	Completed		

# List of SARI/EI, USAID publications (2022-2023)

Publication Number	Title
IRADe-SARI-30	Paper on Risk Mapping and Impact Assessment of COVID-19 on South Asian Power Sector (SAPS)
IRADe-SARI-31	Study Report on Regulatory Interventions for Grid Discipline and Grid Reliability in the South Asian Region
IRADe-SARI-32	BIMSTEC Energy Outlook 2035
IRADe-SARI-34	Building consensus and developing a strategy paper on "Creating Regional Technical Institution/Body for cross-cutting deliberations and promoting excellence towards the development and operation of the regional transmission network in South Asia"
IRADe-SARI-35	Developing a Strategy/White Paper on "Creating Regional Network for sharing operational best practices and promoting harmonization & excellence in Power System Operation across South Asia Region"
IRADe-SARI-36	Strategy Paper for creation of South Asia Forum for Electricity Market (SAFEM) for promoting cross-border electricity trade
IRADe-SARI-37	Study on "Transition of bilateral power trade to trilateral and multilateral power trade in South Asia"
IRADe-SARI-38	Whitepaper on Regional Parliamentary Forum for Energy Cooperation & Energy Trade in South Asia
IRADe-SARI-39	Study on "Assessment of the Cross Border Natural Gas Trading (CBNGT) potential in South Asian countries"
IRADe-SARI-40	Study on "South Asia Energy/Electricity Regulations to Develop Regulatory Road Map For Electricity/Energy Exchange and Energy Cooperation among South Asian Countries"
IRADe-SARI-41	Strategy Paper on "Creation of South Asia Forum on Energy Investment (SAFEI) to Promote Regional Energy Investment"
IRADe-SARI-42	Study on "Assessing the Potential Benefits of Cross Border Electricity Trade for Affordable Supply of Electricity, Facilitating Grid Balancing of Renewable Energy Integration and Suggesting a Framework for Ancillary Service Market in the South Asia Region"
IRADe-SARI-43	Promoting cross-border electricity trade (CBET) through the Power Exchange in India, by all South Asian nations
IRADe-SARI-44	Role of Cross Border Electricity Trade in Enabling the Renewable Energy Deployment & Integration in India/ South Asia Region

#### **SPONSORS**



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