Programme Report

5th Global Regulatory Perspectives Programme for Commissioners of Electricity Regulatory Commissions

Lisbon, Portugal | February 10 – 14, 2026

Organised by:

Centre for Energy Regulation (CER)
Department of Management Sciences (DoMS)
Indian Institute of Technology Kanpur

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Programme Agenda

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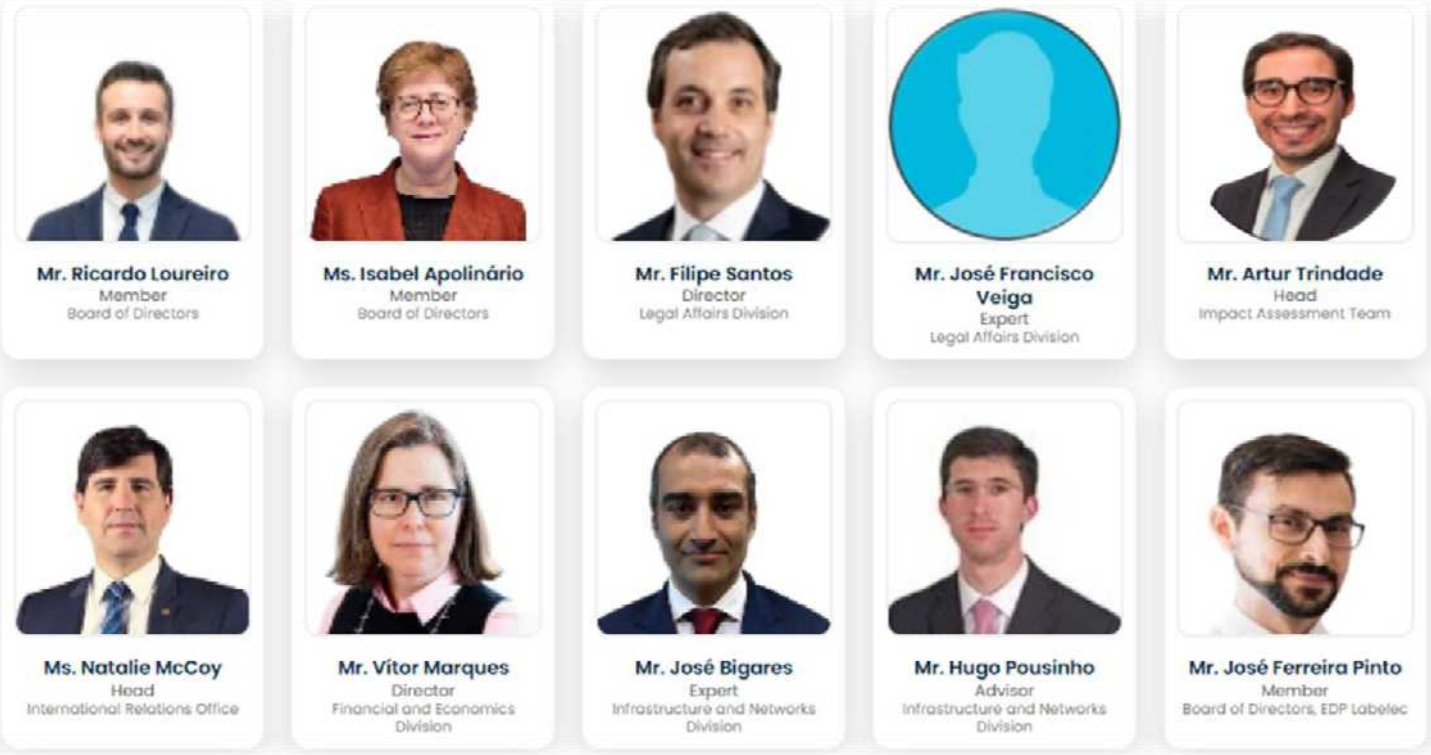
Day 1 – Institutional Visits – Wednesday, 11th February, 2026	
9:30 – 11:15	EDP Labelec (Center of Technical Excellence, EDP Group) Rua Particular à R. Cid. de Goa 2 2685-038 Sacavém GPS: 38.79668277669981, -9.079630017542902
12:00 – 13:30	Visit to Endesa (Electricity Retailer) Quinta da Fonte Rua Malhões, Ed. Dom Manuel I, 3.º Piso 2770-203 Paço d'Arcos GPS 38.71131229518802, -9.299492045001895
13:30 – 14:30	Lunch break

Day 2 – Regulatory exchange at ERSE – Thursday, 12th February, 2026	
09:30 – 09:45	Introduction and welcome (ERSE and CER)
09:45 – 11:15	Regulatory governance and market design - Overview of ERSE powers, responsibilities and legal framework (ERSE) - Regulatory impact assessment instruments (ERSE) - Overview of market and regulatory framework in India (CER)
11:15 – 11:30	Coffee break
11:30 – 13:00	Regulatory framework for network tariffs and quality of supply - Definition of allowed revenues and efficiency parameters (ERSE) - Definition, oversight and incentives for quality of service (ERSE) - Examples of tariff models applied in India (CER)
13:00 – 14:00	Lunch break
14:00 – 15:30	Market and regulatory innovation - Smart networks, decentralised energy and market tools (ERSE) - Smart networks, decentralised energy and market tools (CER)
15:15 – 15:45	Final reflections and closing

Day 3 – Technical Visits – Friday, 13th February, 2026	
11:00 – 12:30	Site visit to Tratolixo (Urban Waste Treatment Facility) Estrada Municipal da Abrunheira Nº 1 Lugar de Fontaínhas Mafra, 2640-745 São Miguel de Alcainça GPS 38.94181417713572, -9.288949820993947
13:00 – 14:30	Lunch break

ERSE (Speaker)



Indian Delegation

Shri Upananda Kataki
Member
Assam Electricity Regulatory Commission (AERC)

Shri Parshuram Singh Yadav
Member
Bihar Electricity Regulatory Commission (BERC)

Shri Ajay Kumar Singh
Member
Chhattisgarh State Electricity Regulatory Commission (CSERC)

Shri Yashwant Singh
Member
Himachal Pradesh Electricity Regulatory Commission (HPERC)

Shri Mahendra Prasad
Member
Jharkhand State Electricity Regulatory Commission (JSERC)

Shri H. K. Jagadeesh
Member
Karnataka Electricity Regulatory Commission (KERC)

Shri Pradeep Balachandran
Member
Kerala State Electricity Regulatory Commission (KSERC)

Shri Gajendra Tiwari
Member
Madhya Pradesh Electricity Regulatory Commission (MPERC)

Shri Biswajit Mohanty
Member
Odisha Electricity Regulatory Commission (OERC)

Shri Ravinder Singh Saini
Member
Punjab State Electricity Regulatory Commission (PSERC)

Shri Hemant Kumar Jain
Member
Rajasthan Electricity Regulatory Commission (RERC)

Shri Venkatesan Krishnan
Member
Tamil Nadu Electricity Regulatory Commission (TNERC)

Ms. Puspita Chakraborty Das
Member
Tripura Electricity Regulatory Commission (TERC)

Shri Raghu Kancharla
Member
Telangana Electricity Regulatory Commission (TGERC)

Shri Prabhat Kishor Dimri
Member
Uttarakhand Electricity Regulatory Commission (UERC)

Shri Sanjay Kumar Singh
Member
Uttar Pradesh Electricity Regulatory Commission (UPERC)

Shri Hiren Navinchandra Shah
Member
Gujarat Electricity Regulatory Commission (GERC)

Prof. Anoop Singh
Professor
Centre for Energy Regulation (CER), IIT Kanpur

Dr. Himanshu Anand
PEO
Centre for Energy Regulation (CER), IIT Kanpur

ERSE (Speaker)

Ricardo Loureiro

Designation: Member, Board of Directors

Educational Profile and Experience: Ricardo Loureiro has wide experience in the energy sector and regulatory landscape. Currently serving as a Member of the Board at ERSE since December 2022, he brings considerable expertise to his role.

His journey in the energy field began as an Economist at the Economic Studies and Market Monitoring Bureau at the National Authority for Competition from 2021 to December 2022. Prior to that, he held prominent positions as an Adviser and Chief of Staff to the Deputy Minister and Secretary of State for energy in the XXII Portuguese Government from 2019 to 2021.

Mr. Ricardo's career path also includes REN – the National Electric Network, where he served in various capacities, including Energy Markets Analyst and Energy Trader. With a solid academic background, Ricardo holds an Executive Master's degree in Corporate Finance and a degree in Economics. He further honed his skills and knowledge through the General Management Programme at Católica Lisbon School of Business & Economics in 2014. Ricardo's knowledge and strategic vision make him a valuable asset in the energy sector

Isabel Apolinári

Designation: Member, Board of Directors

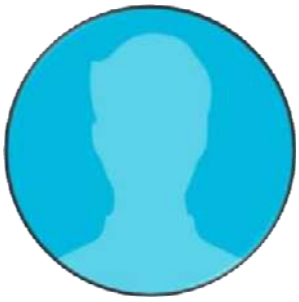
Educational Profile and Experience: Isabel Apolinário brings over two decades of experience in energy regulation to her role as a Member of the Board of Portugal's Energy Services Regulatory Authority (ERSE). With a strong background in economics and a deep understanding of energy policy, Isabel has played a pivotal role in shaping regulatory frameworks and driving innovation in the energy sector.

Isabel's journey in energy regulation began at ERSE, where she started as an officer in the Pricing and Tariffs Division in 1998. Over the years, she progressed through various roles within ERSE, including Senior Advisor and Director of the Pricing, Tariffs and Energy Efficiency Division. Her extensive tenure and comprehensive understanding of pricing and tariffs have positioned her as a trusted leader within the organisation. In addition to her contributions at ERSE, Isabel gained valuable experience in the energy sector at EDP Portugal (electricity distribution). Isabel has also championed the development of energy policy and regulation as an active member of the Gas Working Groups in CEER (Council of European Energy Regulators), ACER (Agency for the Cooperation of Energy Regulators) and MEDREG (Association of Mediterranean Energy Regulators). Her diverse background and hands-on experience have equipped her with a unique perspective on the energy sector. Isabel graduated in economics (1996) and holds a Master's Degree in Economics and Energy and Environment Policy (2005), both from the Lisbon School of Economics and Management (ISEG), Technical University of Lisbon.

Filipe Santos

Designation: Director, Legal Affairs Division

Educational Profile and Experience: Filipe Matias Santos, based in Lisbon, is Head of Legal and Compliance at ERSE, with prior experience at the Agency for the Cooperation of Energy Regulators, Council of European Energy Regulators, NOVA Green Lab, and CEDIPRE - Centro de Estudos de Direito Público e Regulação. His education spans law, finance, and regulation: a law degree and master's from NOVA School of Law, Energy Law training at Faculdade de Direito da Universidade de Lisboa and the European University Institute, and executive programs at Católica Lisbon School of Business and Economics (including PAGE, Gestão, Fall 2022) and Nova School of Business and Economics. He also has earlier exposure to securities enforcement via the U.S. Securities and Exchange Commission and holds a CAE credential from University of Cambridge.



José Ferreira Pinto

Designation: board member, EDP Labelec

José Ferreira Pinto, is a former head of dispatch for E-Redes.

José Francisco Veiga

Designation: Expert, Legal Affairs Division

Educational Profile and Experience: José graduated in Law from the Faculty of Law of the University of Coimbra (FDUC) in 2013 and obtained a Master's degree in Legal and Political Sciences from the same Faculty in 2016. Since 2021, he has been pursuing a PhD in Law at FDUC, in the area of Public Law, focusing on European Union and Energy Law.
He has been registered with the Bar Association since 2017.
He has been a Guest Assistant at ISCAL since 2016 and a Lawyer and Jurist at the Energy Services Regulatory Authority (ERSE) since 2017.
He attended the annual course on energy regulation at the Florence School of Regulation in 2019-2020 and on EU Energy Policy at the College of Europe in 2023. He participated in the preparation of reports for the Council of European Energy Regulators (CEER) on legal matters, namely unbundling, and was a speaker at conferences organised by MEDREG and CEER.

Artur Trindade

Designation: Head, Impact Assessment Team

Educational Profile and Experience: Artur Trindade holds a Master's degree in Economics from the University of Kent in Canterbury. At the beginning of his career, he taught at several Portuguese universities and also worked as a consultant in the banking sector.

In 1999, he joined the Energy Services Regulatory Authority (ERSE) as an economist and has since held various positions, including Director of Regulated Costs and Director-General.

He has held positions outside of ERSE, namely, Secretary of State for Energy in the Portuguese Government (2012-2015), CEO of the Iberian Energy Market Operator - Spanish Hub (OMIE) and CEO of the Iberian Energy Market Operator - Portuguese Hub (OMIP), between 2017 and 2021.

At international level, Artur Trindade chaired the Gas Working Group of the European Energy Regulators (CEER and ACER) in 2016-2017 and was a member of the board of directors of the European Energy Exchange Association (Europex) between 2018 and 2021.

Outside of his role at ERSE, Artur Trindade currently holds the position of Executive Director at the Association of the Portuguese-Speaking Energy Regulators (RELOP).

Natalie McCoy

Designation: Head, International Relations Office

Educational Profile and Experience: Natalie McCoy joined Portugal's Energy Services Regulatory Authority (ERSE) in 2016 to lead its international relations. In this role, Natalie is responsible for leading and coordinating ERSE's international strategy and activities, across a broad geographic canvas, including European, Mediterranean, Ibero-American and Portuguese-language regulatory organisations. As part of these responsibilities, she advises ERSE's Board of Directors on international engagements and coordinates institutional and technical activities across ERSE's departments, with a view to promoting meaningful and longlasting exchanges of experience and cooperation among regulators. She is equally responsible for monitoring EU legislative developments, and managing ERSE's assessment of their relevance and impact on Portugal's regulatory and market framework.

Prior to ERSE, she served as Secretary General of the Council of European Energy Regulators (CEER) between 2011 and 2015. In addition to her responsibilities at ERSE, Natalie co-chairs the CEER Customers and Retail Markets Working Group, following three years as vice chair. She also co-chairs the Agency for the Cooperation of Energy Regulators (ACER) Retail Working Group, established in 2021.

Natalie has more than fourteen years' experience in energy regulation, focusing on customer rights, regulatory governance and electricity and gas market design.

Vítor Marques

Designation: Director, Financial and Economics Division

Educational Profile and Experience: Vitor has a PhD in Economics (2011) from the Faculty of Economics at the University of Coimbra; a MSc in Management (2002) from ISEG – University of Lisbon; BSc in Economics (1995) from the Faculty of Economics, University of Coimbra. Since 2013, he has been Director of the Financial and Economic Department of ERSE. His responsibilities include defining the allowed revenues of regulated activities in the electricity, gas and electric mobility sectors, through the development of regulatory methodologies and economic parameters such as asset remuneration rates and efficiency targets.

He also carries out auditing and supervisory activities to assess compliance with ERSE regulations. His work is frequently developed in cooperation with other European energy regulators, notably within CEER and ACER.

He is a specialist in economic regulation of the energy sector, with research published in national and international books and scientific journals. He has delivered training on sectoral regulation to European regulators, regulatory authorities outside Europe, and Portuguese universities at master's and PhD levels. Smart grids are one of the main focuses of his most recent research.

Hugo Pousinho

Designation: Advisor, Infrastructure and Networks Division

Educational Profile and Experience: Hugo Pousinho received Engineering (2008) and Master's (2009) degrees in Electromechanical Engineering from the University of Beira Interior (UBI), Covilhã, Portugal, and Ph.D. degree (2012) in Electrical and Computers Engineering also from UBI.
He was also an Invited Assistant Professor at University of Évora, in 2014. Currently, he is an Advisor at the Portuguese Energy Services Regulatory Authority (ERSE), in Department of Infrastructure and Networks.
His research interests include quality of electricity and gas supply, data measurement and handling and power systems operations.

José Bigares

Designation: Expert, Infrastructure and Networks Division

Educational Profile and Experience: Specialist in the Operation and Quality of Service Unit, of the Energy Services Regulatory Authority (ERSE).

With 15 years of experience in the energy sector he joined ERSE in 2020 in the Infrastructures and Networks Directorate, developing activities in the areas of electric mobility, smart grids, self-consumption and energy communities and system operation.

Until 2020 he worked at the General Directorate for Energy and Geology in licensing of power plants, distributed generation and implementing the legal framework of the electrical sector.
He is licensed in Electrical and Computer Engineering with a Master's degree in Energy from the Technical University of Lisbon (IST-UTL).

Shri Upananda Kataki

Designation: Member (Technical)

Organisation: Assam Electricity Regulatory Commission (AERC)

Educational Profile: B.E. (Electrical Engineering) from Assam Engineering College under Guwahati University. Certified professional in: (i) Corporate Governance of 'Indian Institute of Corporate affairs', (ii) Harvard Manage Mentor of 'Harvard Business Publishing-Corporate Learning', (iii) Advance Management Programme' of 'Indian School of Business (ISB) - Executive Education'

Experience: Shri Upananda Kataki assumed the role of Member (Technical) at the Assam Electricity Regulatory Commission (AERC) on September 1, 2025. He brings 35 years of extensive experience in the power transmission sector, having worked with NEEPCO Ltd. (1989) and the Maharatna Power Grid Corporation of India Limited (POWERGRID) since 1991. At POWERGRID, he rose to become Executive Director and Regional Head of the North Eastern Region, while also serving as Director of POWERGRID ER NER Transmission Ltd. (2022–24).

Throughout his career, Shri Kataki played a lead role in the execution and maintenance of numerous critical 400KV, 220KV, and 132KV projects across North Eastern states, including the +/- 800KV HVDC Agra-Biswanath Chariali line. Beyond technical execution, he spearheaded the establishment of the 'Transmission Line Maintenance Institute' at the Misa Substation, training approximately 350 local unemployed youth in EHV tower skills under a CSR initiative. A recipient of the POWERGRID UTTAM AWARD, he has also been recognized for his remarkable leadership in regional asset management and the successful execution of the BNC-Lower Subansiri transmission line.

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Organisation's Website: http://aerc.gov.in

Shri Parshuram Singh Yadav

Designation: Member

Organisation: Bihar Electricity Regulatory Commission (BERC)

Educational Profile and Experience: Mr. Parshuram Singh Yadav joined the Bihar Judicial Services in 1990 after graduating from Gorakhpur University (B.A.) and Allahabad University (LL.B.). Over an extensive 32-year career, he held prestigious positions including District and Sessions Judge, Chairman of the Land Acquisition, Rehabilitation and Resettlement Authority (LARRA), and Principal Judge of the Family Court. He specialized in high-profile litigation as the state's First Special Judge for elected MPs and MLAs/MLCs, and served as a Special Judge for POCSO, Excise, and SC/ST Act cases.

His vast experience spans Criminal, Civil, Family, Property, MACT, and ADR laws. Notably, he expedited numerous high-stakes political cases and actively promoted Alternative Dispute Resolution as a mediator in marital disputes and as Chairman of District Legal Services Authorities overseeing Lok Adalats. Through these diverse roles, he developed a profound expertise in managing complex legal domains and facilitating out-of-court settlements.

Other Information:. He significantly enriched his judicial persona through extensive training in criminal justice, case management, and appellate procedures. His expertise was further refined through specialized courses on sentencing techniques, mediation, and crimes against marginalized communities at the LNJN National Institute and Bihar Judicial Academy. These programs, covering session trials and family law, shaped his comprehensive understanding of timely and qualitative justice.

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Organisation's Website: bercpat@bihar.gov.in

Shri Ajay Kumar Singh

Designation: Member

Organisation: Chhattisgarh State Electricity Regulatory Commission (CSERC)

Educational Profile and Experience: B.E. (Electrical) (Hons.) from the Government Engineering College, Rewa, in the month of August, 1988.
Started his career with Madhya Pradesh Electricity Board in the month of April, 1989 as an Assistant Engineer Trainee and contributed to power transmission work until 2000.
After the formation of Chhattisgarh in 2000, he held various positions with the Chhattisgarh State Electricity Board, Chhattisgarh State Power Transmission Company, and Chhattisgarh State Power Distribution Company, handling various 220 kV and 132 kV substations, metering Relay Testing, distribution, vigilance, and commercial office.
He has been awarded by then Chhattisgarh State Electricity Board in the year 2008. He was promoted to the post of Chief Engineer in 2025. After completing 35 years of service, he took voluntary retirement from the position of Chief Engineer in the Chhattisgarh State Transmission Company Limited on June 17, 2025. From July 18, 2025, he was appointed as Member (Technical) of Chhattisgarh State Electricity Regulatory Commission.

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Organisation's Website: cserc.gov.in

Shri Yashwant Singh

Designation: Member

Organisation: Himachal Pradesh Electricity Regulatory Commission (HPERC)

Educational Profile and Experience: Born on 10th January, 1962 at Chauntra, Tehsil Joginder Nagar, Distt. Mandi, H.P. Passed Higher Secondary Examination in the year 1980 from HP Board of School Education. Graduated from Govt. College for Men, Sector 11 Chandigarh in the year 1983. Completed Bachelor of Laws (LLB) from Punjab University, Chandigarh in 1986. On completion of Law Degree, enrolled as an Advocate with Bar Council of Punjab and Haryana and practiced at the High Court of Punjab and Haryana at Chandigarh and Himachal Pradesh till April, 1990. Was selected as Assistant Public Prosecutor-cum-Assistant Distt. Attorney in the state of Himachal Pradesh and served till 10th January, 1992. Was selected as Legal Officer Grade 'B' in the Reserve Bank of India and joined as such on 15th January, 1992 at Law Department, Reserve Bank of India, Mumbai. Was selected as Sub-Judge-cum- Judicial Magistrate in the State of H.P. and joined as such at Shimla on 8th August, 1995. Has served at various places in the State of Himachal Pradesh as Civil Judge, Sr. Civil Judge, Rent Controller, Sub- Divisional Judicial Magistrate, Additional Chief Judicial Magistrate and also remained posted as Chief Judicial Magistrate-cum-Senior Civil Judge, Shimla, H.P. from January, 2007 to April, 2010. Promoted as Additional District and Sessions Judge in the month of April, 2010 and served at Chamba (Distt. Chamba), Ghumarwin (Distt. Bilaspur) and Una (Distt. Una) H.P.

Also served as Joint Director, H.P. Judicial Academy, Shimla in the year 2013 and Registrar (Judicial) in the High Court of Himachal Pradesh in the year 2014. Was appointed as Member Secretary, H.P. State Legal Services Authority in the month of October, 2014 and remained as such till February, 2018 when was appointed as Legal Remembrancer-cum-Principal Secretary (Law) to the Government of Himachal Pradesh and served in such capacity till 30.06.2021. Was selected as Member (Law), H.P. Electricity Regulatory Commission and took pre mature retirement from the Judicial service on 30.06.2021 and joined as Member (Law), H.P. Electricity Regulatory Commission on 01.07.2021.

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Organisation's Website: https://hperc.org/

Shri Mahendra Prasad

Designation: Member (Law)

Organisation: Jharkhand State Electricity Regulatory Commission (JSERC)

Educational Profile and Experience: Passed Matriculation in 1977 from Sarvodaya High School, Sughari (Nawada) and completed Inter Science and B.Sc from Kisan College, Sohsarai, Bihar. Passed LLB from A.N. College Gaya in the year 1987. After that, enrolled as Advocate Bar Council and practiced Civil, Criminal, Revenue at Gaya District Bar Association and Nawada District Bar Association. Selected as Judicial Officer through BPSC Patna as 24th Batch and joined as Judicial Magistrate at Civil Court Munger on 15th December 1995.

On Cadre Division, he has been allotted to Jharkhand Cadre and in due course served as SDJM, Civil Judge (Senior Division), Secretary DALSA at different Civil Court of Jharkhand and thereafter promoted to District Judge on 08th August 2014. Further, promoted as Principal District Judge in 2018. Also, served as Secretary Jharkhand Vidhan Sabha since 26.08.2018 to 23.09.2021 and retired on 31.01.2022. Currently working as Hon'ble Member (Law) in Jharkhand State Electricity Regulatory Commission from 10th June, 2022.

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Organisation's Website: www.jserc.org

Shri Jagadeesh Hanumanthegowdanadoddi Kempaiah

Designation: Member

Organisation: Karnataka Electricity Regulatory Commission (KERC)

Educational Profile and Experience: B.Com., LLB.,

Joined Karnataka State Judiciary in the year 1995 as Civil Judge & Judicial Magistrate First Class & promoted to the cadre of District Judge in the year 2009. Served in State Judiciary till 2013. Then served in Law Dept. Karnataka Govt. Secretariat as Addl/Special Law Secretary to Govt. between 2013 & February, 2024.

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Organisation's Website: kerc.karnataka.gov.in

Shri Pradeep Balachandran

Designation: Member (Technical)

Organisation: Kerala State Electricity Regulatory Commission (KSERC)

Educational Profile and Experience: B. Tech in Electrical Engineering. 31 years of experience in Power Sector utilities. 3 years' experience in Regulating Power Sector

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Organisation's Website: www.erckerala.org

Shri Gajendra Tiwari

Designation: Member

Organisation: Madhya Pradesh Electricity Regulatory Commission (MPERC)

Educational Profile and Experience: Shri Gajendra Tiwari is a seasoned professional in the power sector, currently serving as a Member of the Madhya Pradesh Electricity Regulatory Commission (MPERC) since September 2025. He holds a Bachelor of Engineering in Electrical Engineering (1985) and a Master of Technology in Heavy Electrical Equipment (2002), both from MANIT, Bhopal, and is a certified Energy Auditor by the Bureau of Energy Efficiency. His career at MPERC spans over two decades, during which he has held several high-level positions, including Electricity Ombudsman from January 2024 to September 2025, Secretary from July 2021 to September 2022, and a long-standing tenure as Director of Tariff and Law & Resources from 2007 to 2021. Throughout his extensive service, he has been deeply involved in various facets of the commission's regulatory and administrative functions.

Other Information: Served at various positions for more than 20 years in M.P. Electricity Regulatory Commission

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Organisation's Website: www.mperc.in

Shri Biswajit Mohanty

Designation: Member (Legal)

Organisation: Odisha Electricity Regulatory Commission (OERC)

Educational Profile and Experience: B.Sc, LL.B., Retired District Judge. During his service career as a Judicial Officer spanning more than 27 years from 1997 to 2025, apart from being the Principal District and Sessions Judge of Kendrapara in the State of Odisha, I have worked as Registrar (Vigilance), Registrar (Administration) of Orissa High Court, Member Secretary of Odisha State Legal Services Authority, Additional Secretary to Govt. of Odisha in the Law Department and Director (I/c) of Odisha Judicial Academy, Cuttack

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Organisation's Website: www.orierc.org

Shri Ravinder Singh Saini

Designation: Member

Organisation: Punjab State Electricity Regulatory Commission (PSERC)

Educational Profile and Experience: Er. Ravinder Singh Saini is a transformational leader in the power sector with 38 years of experience driving operational excellence. He holds a BSc. in Mechanical Engineering with Honors from the Regional Engineering College (N.I.T.), Rourkela. Currently, since July 2025, he serves as a Member of the Punjab State Electricity Regulatory Commission (PSERC), where he adjudicates matters involving licensees and generators, sets tariffs, and monitors consumer grievance redressal. Previously, from March 2026 to February 2025, he was the Director of Commercial, HR, and Administration at PSPCL. In this role, he executed commercial policies, oversaw strategic planning for power distribution, and orchestrated the successful acquisition of GVK Power's Goindwal Sahib Thermal Plant.

From 2020 to 2026, as Engineer-in-Chief, he spearheaded Punjab's largest smart metering rollout and implemented a unified billing solution for all PSPCL consumers. His earlier career highlights include serving as Deputy Chief Engineer for the Mohali and Khanna Circles (2015–2020) and holding various engineering roles from 1987 to 2015, during which he led urban electrification projects and executed thermal power projects at GGSTP, Ropar. His core expertise includes smart metering, IT modernization, regulatory compliance, and industrial relations.

Other Information: Passionate about consumer satisfaction in respect of reliable and economic supply of quality power, transparent billing and grievance redressal and promotion of renewable energy. Key Skills include Power Distribution & Commercial Operations | Thermal Power Generation & Electrification| IT Implementation & Smart Metering | Regulatory Compliance & Policy Development |Procurement, Material & Store Management | HR, Administration & Industrial Relations | Corporate Governance & Public Relations

Email: ravindersaini1017@yahoo.com

Organisation's Website: https://pserc.punjab.gov.in/

Shri Hemant Kumar Jain

Designation: Member

Organisation: Rajasthan Electricity Regulatory Commission (RERC)

Educational Profile and Experience: Shri Hemant Kumar Jain was born on 02.07.1962. He did his Graduation (B.com) in1981 from University of Rajasthan, LL.B in 1984 from the Jodhpur University, Jodhpur and awarded degree of Chartered Account in 1985 from The Institute of Chartered Accounts of India. He completed both the courses simultaneously.

He initially started his carrier in 1985, Practiced as Chartered Accountant. Later he was selected in Rajasthan Judicial Service in April 1990, he worked on various posts viz, Joint L.R., Law Department, Secretariat, Additional District & Sessions Judge, Presiding Officer in Waqf Tribunal, Industrial Tribunal, Jaipur, Distt.& Session Judge Jaipur - Metro, Alwar, Chittorgarh & Jhunjhunu. In the year 2003 elevated to Rajasthan Higher Judicial Service joined on 17.04.2003. He was appointed Member, Rajasthan Electricity Regulatory Commission (RERC) Jaipur by the State Government on 30.05.2022 and was sworn in as Member, RERC by the Hon'ble Chief Justice of Rajasthan on 04.07.2022.

Email: rercjpr@yahoo.co.in

Organisation's Website: https://rerc.rajasthan.gov.in/

Shri Venkatesan Krishnan

Designation: Member

Organisation: Tamil Nadu Electricity Regulatory Commission (TNERC)

Educational Profile and Experience: B.E (EEE) Graduated from Government College of Technology (GCT), Coimbatore in 1983.

He worked as an Instructor at Valivalam Desikar Polytechnic College, Nagapattinam, from September, 1983 to January, 1986. In 1986, he joined the Tamil Nadu Electricity Board (TNEB) and served in multiple domains including Thermal, Distribution, Planning, and the Commercial wing, eventually superannuating as an Additional Chief Engineer on 30th June, 2019.

During his tenure with TNEB, he also gained international experience by working as an Erection Engineer with M/s. Hyundai Engineering Company in Libya from November 1995 to 1996, where he oversaw the stringing of a 220 kV transmission line spanning 320 km and comprising 820 towers, while on Extraordinary Leave. Later, he served as Director (Engineering) at the Tamil Nadu Electricity Regulatory Commission (TNERC) from 2nd March, 2022 to 16th July, 2022, and he is currently serving as Member (Technical) in TNERC.

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Organisation's Website: www.tnerc.tn.gov.in

Ms. Puspita Chakraborty Das

Designation: Member

Organisation: Tripura Electricity Regulatory Commission (TERC)

Educational Profile and Experience: Ms. Puspita Chakraborti completed her Graduate Degree in Bio-Science. In 1994, she obtained her B.A. LL.B. (Five-Year Course) from the University of Calcutta and commenced her legal practice at the City Civil Court, Sealdah, Kolkata. Subsequently, in 1996, she joined the Bar of the High Court of Tripura. She was appointed as a Guest Lecturer at Tripura Government Law College and also served as a Member of the Continuous Lok Adalat. Ms. Chakraborti has been empanelled as a lawyer for several reputed institutions, including the State Bank of India, Indian Bank, Axis Bank, Axis Bank, Punjab National Bank, LIC, among others.

Other Information: She is also a renowned singer of Tripura. Presently, she is serving as a Member of the Tripura Electricity Regulatory Commission (TERC).

Email: member.terc@gmail.com

Organisation's Website: https://terc.tripura.gov.in/

Shri Raghu Kancharla

Designation: Member (Technical)

Organisation: Telangana Electricity Regulatory Commission (TGERC)

Educational Profile and Experience: Shri Kancharla holds a Master's degree in Structural Engineering and is a Certified Energy Manager and Auditor accredited by the Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. He has over 35 years of experience in the power sector, during which he progressed from Assistant Engineer to Chief Engineer across organizations such as APSEB, APTRANSCO, APTRIPCO, and TGTRANSCO. His experience includes extensive work in EHT substations and transmission systems, mini-hydel projects, energy efficiency initiatives, and regulatory proceedings.

Other Information: Actively involved in tariff and PPA public hearings; author of books and technical manuals on power sector subjects; led large-scale training initiatives, including online programs during COVID-19; international exposure through technical conferences in Asia.

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Organisation's Website: www.tgerc.telangana.gov.in

Shri Prabhat Kishor Dimri

Designation: Member

Organisation: Uttarakhand Electricity Regulatory Commission (UERC)

Educational Profile and Experience: Prabhat Kishor Dimri is a highly qualified professional with a diverse academic background, holding a B.Sc. (PCM) from Garhwal University, a B.E. in Electrical Engineering from Gorakhpur University, and an LLB from Uttarakhand Technical University. He furthered his management and technical expertise with an MBA in Finance from Sikkim Manipal University, an Advanced Course in Power Distribution Management (ACPDM) from IGNOU, and is a Fellow of the Institution of Engineers (India).

With over 34 years of extensive experience, Shri Dimri has served in various capacities across several prominent organizations, including Triveni Structural Limited, Damodar Ropeways & Construction Co., Garhwal Mandal Vikas Nigam (GMVN) Ltd., and UJVN Ltd. His career in the regulatory sector is marked by his tenure as Director (Technical) at the Uttarakhand Electricity Regulatory Commission (UERC), where he currently serves as Member (Technical). In addition to his professional roles, he has contributed to legal and sectoral discourse through publications in international journals concerning energy sector regulations, consumer protection, and electricity supply law

Other Information: Participated in Different National and International Training Programs/Workshops/Seminars organized by various Reputed Organisations/Institutions.

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Shri Sanjay Kumar Singh

Designation: Member

Organisation: Uttar Pradesh Electricity Regulatory Commission (UPERC)

Educational Profile and Experience: Dr. Sanjay Kumar Singh has around 37 years of experience in power sector, out of which 20 years with UP Electricity Regulatory Commission and 17 years with State Power Corporation spanning across Transmission, Commercial & Project Execution. Exposure of Regulatory Commission has instilled in him understanding of tariff determination, process of competitive bidding, nuances of power purchase agreement, licensing related and overall regulatory insight.

He is amongst the officers, who got involved with UP Electricity Regulatory Commission right at the time of its creation, and he is witness to evolution of regulatory system both before and in the aftermath of promulgation of Electricity Act, 2003, and was directly involved in framing various regulations. Dr. Singh has 18 Years' experience in regulatory field which is among highest in the country.

Dr. Singh has worked across all regulatory fields such as Tariff, Licensing, framing regulations & drafting orders while working in Regulatory Commission. Whereas, as Director (Commercial), UP Power Corporation Ltd. (the biggest power sector government utility in the country) he was responsible for all Commercial functions including revenue realisation, nuances of power purchase agreements and setting up of IT platforms etc.

Being an Alumni of IIT, BHU, MDI and Allahabad University (LLB) and having around 35 years of experience in power sector, he has developed holistic understanding of techno- commercial and techno-legal aspects of power sector.

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Shri Hiren Navinchandra Shah

Designation: Member

Organisation: Gujarat Electricity Regulatory Commission (GERC)

Educational Profile and Experience: Shri Hiren Navinchandra Shah is a seasoned power sector professional with over 35 years of diverse experience in Gujarat's electricity sector, currently serving as a Member of the Gujarat Electricity Regulatory Commission (GERC) since December 2025.

His career includes high-level leadership roles such as General Manager (Renewable Energy) at Gujarat Urja Vikas Nigam Limited (GUVNL), where he led the state's renewable energy programs and competitive bidding processes. Throughout his tenure, he has gained comprehensive expertise across functional domains, including power procurement, grid operations, and regulatory matters, and has also served in technical and administrative capacities as an Executive and Superintending Engineer. Beyond his technical and regulatory contributions, Shri Shah has been a certified heartfulness meditation trainer for more than 35 years, a practice that supports his disciplined approach to leadership and public service.

Other Information: He is a certified heartfulness meditation trainer for over 35 years, which has supported a balanced, disciplined and reflective approach to leadership, decision-making and public service.

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Dr. Anoop Singh

Designation: Professor, Department of Management Sciences, IIT Kanpur, Founder & Coordinator, Energy Analytics Lab (EAL) and Centre for Energy Regulation (CER)

Organisation: Department of Management Sciences, IIT Kanpur

Educational Profile and Experience: PhD, M.Tech (Industrial Engineering) and B.Tech (Mechanical Engineering)

Having over 23 years of experience in academia and industry, a distinguished figure in the field of Power Sector Regulation and Policy.

As the Founder & Coordinator of Energy Analytics Lab (EAL) and Centre for Energy Regulation (CER) at IIT Kanpur, significantly advanced research and insights in Power Sector Reforms, Energy Analytics, Power Market and Renewable Energy.

A prolific contributor to Regulatory and Policy discussions, actively engaging with influential bodies such as the Ministry of Power, Ministry of New and Renewable Energy, various regulatory commissions and Power Exchanges.

Areas of interest in Power Sector Reforms, Power Market Development, Energy Pricing, Renewable Energy Policy and Regulations, Energy Economics, Climate Change, Project financing and Cross-Border energy cooperation.

Beyond academic role, serves as an Independent Director, participates in key committees, Central Advisory Committee and coordinates a pioneering eMasters Degree Program “Power Sector Regulation, Economics and Management” at IIT Kanpur. Extensive contributions including books publications, Editor of Power Chronicle and Regulatory Insights, underscore his impact on the energy sector's evolution and capacity building.

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Dr. Himanshu Anand

Designation: Project Executive Officer

Organisation: Centre for Energy Regulation (CER) and Energy Analytics Laboratory (EAL), IIT Kanpur

Educational Profile and Experience: Post-Doctoral Fellow in Power Sector Regulation at IIT Kanpur, Centre for Energy Regulation (CER) and Energy Analytics Laboratory (EAL) (2023); Ph.D. in Power System Operation and Optimization from Thapar Institute of Engineering & Technology (TIET) (2021); M.E. in Power Systems from Thapar University (2014); and B.Tech in Electrical Engineering from Govt. College S.B.S. CET (2012).

Dr. Himanshu Anand is a power sector professional with over nine years of experience in regulatory research and power sector modelling. He is currently working as a Project Executive Officer at the CER and EAL, IIT Kanpur. His work involves coordinating research projects, regulatory studies, and capacity-building programs in the power sector. His responsibilities include project management, stakeholder engagement with regulators and system operators, preparation of research proposals, research reports, and policy briefs, and the organization of training programs and workshops. His research interests include power market design, renewable energy integration, resource adequacy, power system modelling, long-term electricity demand forecasting, optimization, power system flexibility, electric vehicles, energy storage, decarbonization of the power sector, and resource planning.

Dr. Anand has previously worked at the Council on Energy, Environment and Water (CEEW), where he was involved in research on power system flexibility, renewable energy integration, and the repurposing of thermal power plants for the energy transition. He has also served as an Assistant Professor at TIET and MEFGI, where he was engaged in teaching and research in power systems and energy studies, including electricity demand forecasting, energy planning, and power system analysis. Dr. Anand has published more than ten research papers in reputed SCI and Scopus-indexed journals and research reports in the areas of power system optimization, unit commitment, forecasting, RE integration, MBED, SCED, Power Market Monitoring for Power Sector, Resource Adequacy, RPO, and combined heat and power systems.

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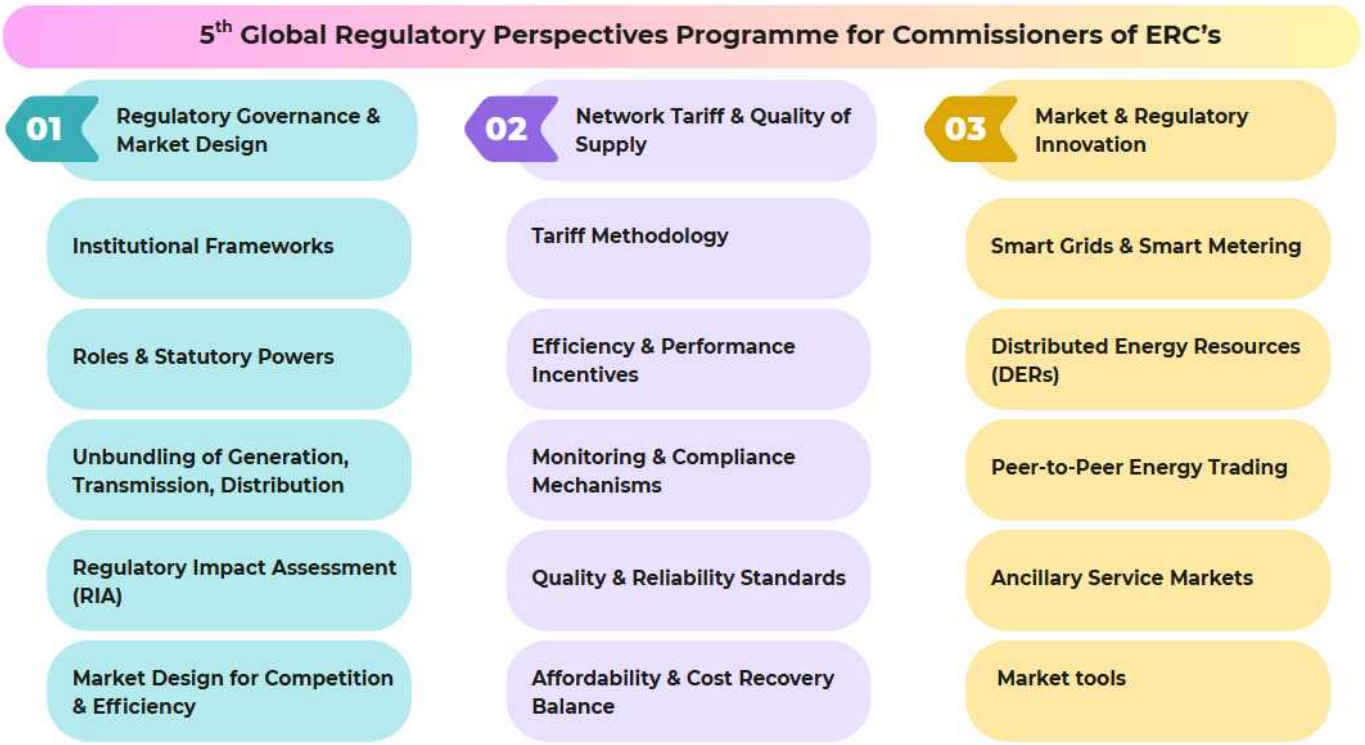
Overview of 5th Global Regulatory Perspectives Programme for Commissioners of ERC's

The study visit aims to facilitate knowledge exchange and peer learning between Commissioners of State Electricity Regulatory Commissions (SERCs) in India and counterparts from ERSE, coordinated by the Centre for Energy Regulation (CER). The visit will provide a platform to share experiences, regulatory practices, and innovative approaches to strengthen electricity sector governance, enhance market efficiency, and support the transition toward modern, resilient, and consumer-centric power systems.



Day 1: Session Highlights

EDP Labelec (Center of Technical Excellence, EDP Group)

During Day 1 of the visit (11 February) at the EDP Labelec Campus, the Indian delegation was welcomed and given a comprehensive overview of Labelec's capabilities through presentations and guided visits to its laboratories, including the EHV Electrical Laboratory, SmartLab, Environmental Laboratory, and Insulating Materials Laboratory. The sessions highlighted Labelec's role in delivering advanced technical studies and testing solutions to support power system reliability, regulatory compliance, and the energy transition, in alignment with European and international standards. The delegation also engaged in detailed discussions with experts, with a particular focus on Labelec's Environmental Area. These interactions showcased Labelec's multidisciplinary expertise, developed over more than 35 years, in providing consultancy and practical solutions related to environmental permitting, regulatory compliance, and emerging challenges across various energy production technologies.

Key highlights about EDP Labelec:

- **Technical Studies & System Analysis:**
  - Grid integration studies
  - Interference analysis (overhead lines/cables)
  - Insulation coordination and grounding system studies
  - Power quality, reliability, and electromagnetic field assessment
  - Post-mortem incident analysis using simulation to identify root causes and preventive measures
- **Regulatory & Standards Alignment:**
  - Compliance with European Network Codes (EU 2016/631) and national regulations
  - Power plant performance evaluation and digital modelling (PSS®E, PowerFactory, EMTP-RV)
  - Power quality monitoring in line with EN 50160 and regulatory codes
- **Power Quality Monitoring & Studies:**
  - Continuous monitoring of voltage, frequency, harmonics, flicker, and interruptions
  - Identification of harmonic sources and network resonance points
  - Support to DSOs for improving grid performance and compliance
- **SmartLab Capabilities (Energy Transition Focus):**
  - Digital Grid: simulation of smart grids and smart metering systems
  - Calibration: accredited metrology and verification of smart meters
  - Substation Automation: testing of HV/MV control and automation systems
  - Storage & Mobility: testing of energy storage systems and electric mobility solutions
- **Innovation in Energy Systems:**
  - Testing and validation of energy storage (from cell-level to large-scale systems)
  - Electric vehicle infrastructure testing (AC/DC chargers, residential to public)
  - Smart home integration with microgeneration, smart appliances, and energy management systems
  - Focus on flexibility and interoperability for future-ready smart grids
- **Collaboration & Knowledge Sharing:** Strong partnerships with universities and international bodies, along with active engagement in training, workshops, and knowledge dissemination initiatives.

SMARTLAB Digital Grid

Smart Metering

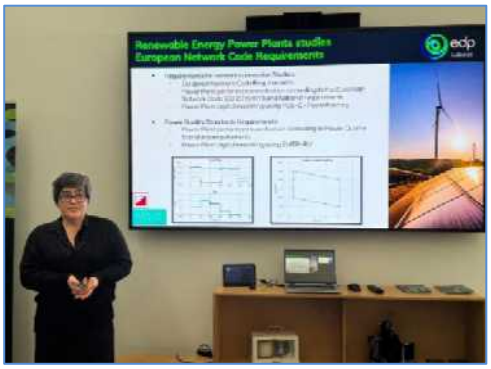
This laboratory aims to test advanced smart metering solutions for the low-voltage electric grid, both as standalone equipment and as integrated systems, supporting the ongoing grid digitalization.

Communication Tests

It is an all-encompassing lab infrastructure replicating field equipment and head-end systems in controlled environment, allowing simultaneous performance testing on 4 independent grids and up to 400 smart meters.

Cybersecurity

It also provides testing capabilities focused on supporting the development of a more secure and reliable grid, facing the cyber challenges arising from its digitalization with the most effective defense strategies available.



The speaker provided the Indian delegation with an overview of the Tests & Trials capabilities at EDP Lab (Labelec), highlighting its role in supporting asset performance, reliability, and regulatory compliance in the power and energy sector. The discussion emphasized the integration of engineering expertise and advanced laboratory solutions to enhance innovation, safety, efficiency, and sustainability across energy systems.

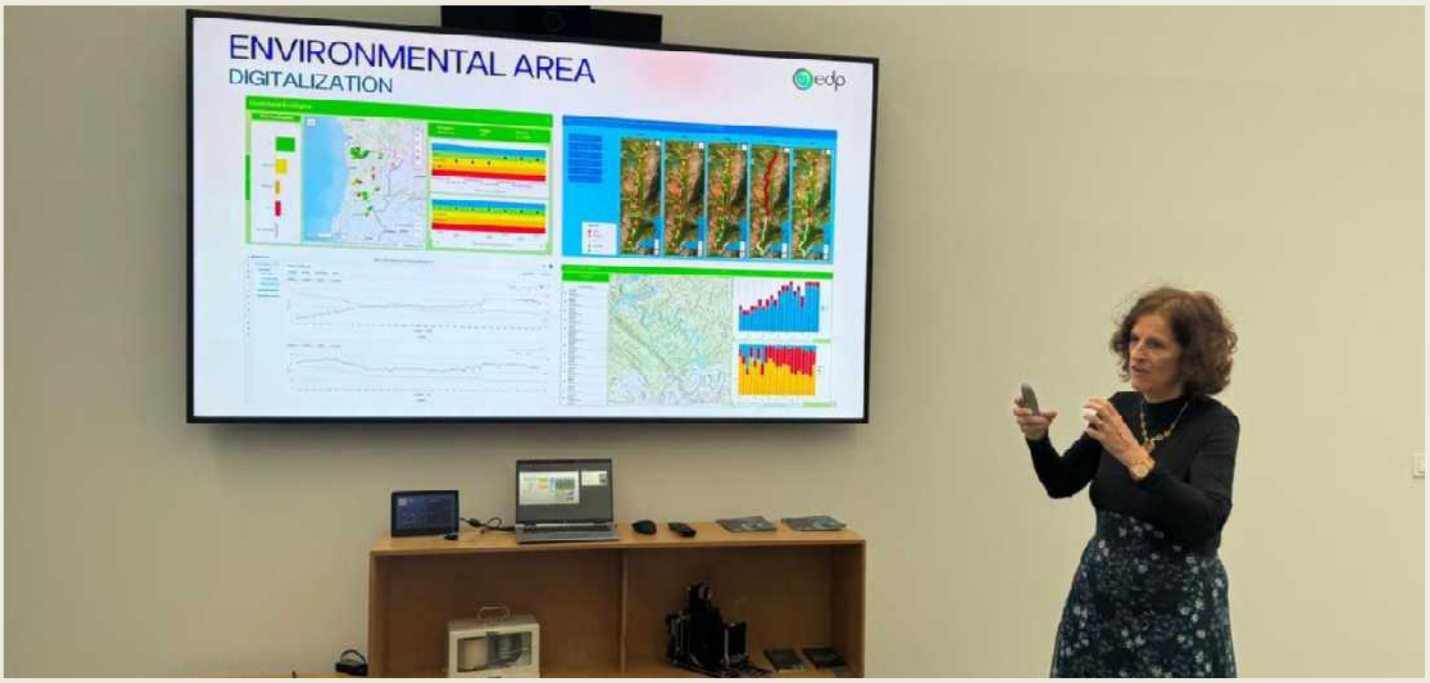
Key highlights from the discussion:

- Comprehensive Tests & Trials framework covering asset performance evaluation, product validation/certification, and post-mortem analysis
- Strong focus on innovation, accuracy, efficiency, and lifetime extension of electrical assets
- Application of AI, robotics, and health index methodologies to improve asset monitoring and decision-making
- Electric and electromechanical testing, including partial discharge measurement, ageing tests, and electromagnetic field assessment
- Advanced insulating materials analysis, including oil (mineral and vegetal) testing, transformer health index evaluation, and oil regeneration
- Asset inspection services, such as thermographic inspections of transmission infrastructure and laser-based distance measurements for safety compliance
- Laboratory and field testing of power transformers to ensure reliability and operational efficiency
- Development and testing of innovative MV pole solutions for bird protection, reflecting environmental and sustainability considerations
- End-to-end support for utilities and manufacturers in maintaining, optimizing, and extending asset life cycles

The speaker also emphasized their extensive capabilities in monitoring reservoirs and rivers, including sampling and analysis of chemical, biological, and hydromorphological parameters, supported by accredited laboratories (over 200 tests certified by IPAC) ensuring high-quality analysis of natural waters, wastewater, industrial water, drinking water, and solid samples. Key services include water quality consulting; design and optimization of monitoring programs; real-time and conventional monitoring of surface and groundwater systems; environmental flow assessment; industrial and drinking water monitoring; characterization of wastewater, soils, sediments, and solid waste; calibration of continuous monitoring equipment; and studies on biofouling and corrosion.

The discussion also underscored Labelec's strong focus on digitalization and R&D, including sustainable soil regeneration techniques that reduce chemical use and environmental impact, as well as advanced water quality monitoring using satellite data integrated with machine learning and deep learning for near real-time, large-scale assessment and predictive analysis. The use of aquatic drones for reservoir monitoring was highlighted as an innovative solution enabling safe, high-resolution, real-time data collection, particularly in remote or hazardous environments.

The speaker highlighted Labelec's work in carbon measurement for voluntary carbon markets, emphasizing robust quantification of carbon in soil and vegetation, enabling the generation of certified carbon credits. These efforts support emission compensation, enhance environmental credibility, and contribute directly to climate transition objectives, reflecting alignment with evolving global regulatory and market-based mechanisms for carbon management.



Overall, the interaction provided valuable insights into global best practices in environmental monitoring, grid studies, laboratory testing, and regulatory compliance. It highlighted how advanced simulation tools, digital laboratories, and integrated testing environments support data-driven decision-making and enable the transition toward resilient, efficient, and sustainable energy systems, while promoting innovation in sustainability and climate action.

Laboratory Visit

- EHV electrical laboratory
- SmartLab laboratories
- Environment laboratory
- Insulating Materials laboratories

Visit to Endesa (Electricity Retailer)

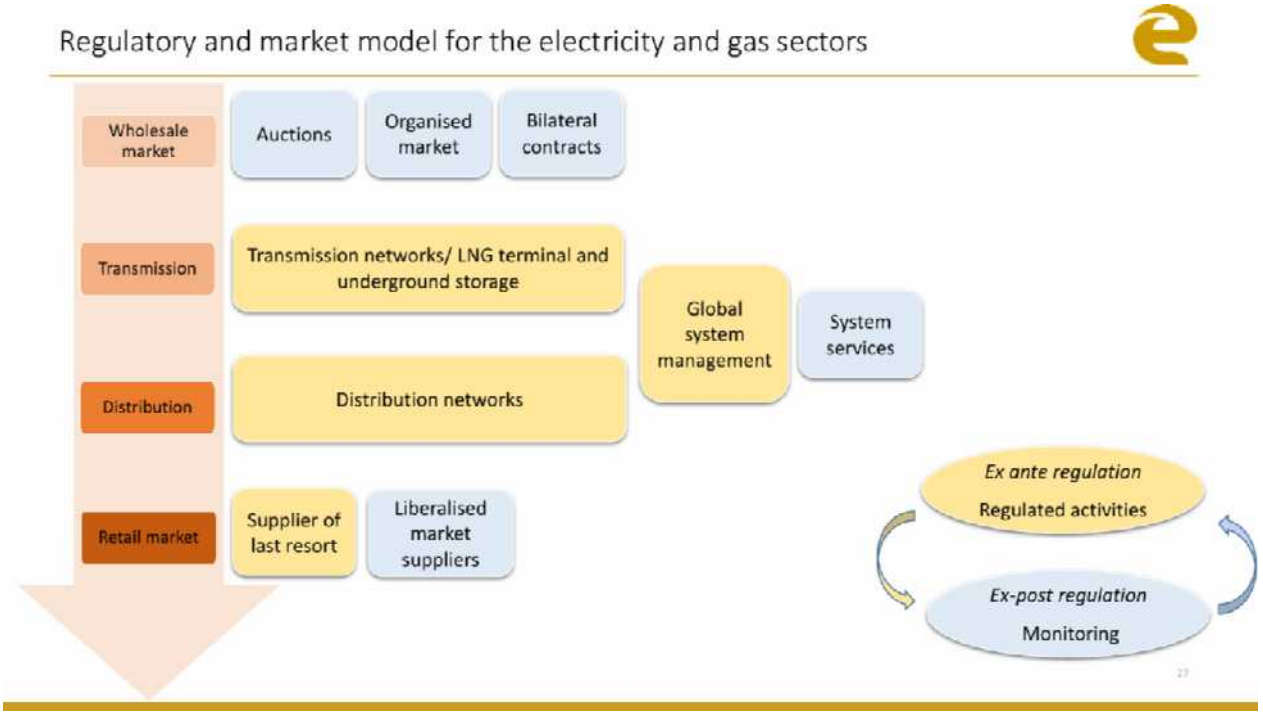
Endesa is a leading Spanish integrated utility operating across electricity generation, distribution, and retail supply, with a strong presence in both power and natural gas markets and a dominant position in Spain's energy sector. Endesa operates in Portugal as part of the liberalized Iberian electricity market, where competitive pressures and regulatory frameworks shape its strategy.

Day 2: Session Highlights

During Day 2, the delegation participated in a regulatory exchange session at ERSE, focusing on key aspects of regulatory governance, market design, and innovation. The session began with an overview of ERSE's powers, responsibilities, and legal framework, along with its use of regulatory impact assessment tools, followed by a presentation from Centre for Energy Regulation on the market and regulatory framework in India. Discussions then covered the regulatory approach to network tariffs and quality of supply, including methodologies for determining allowed revenues, efficiency parameters, and mechanisms for monitoring and incentivizing service quality, complemented by examples of tariff models applied in India. The session also highlighted emerging areas of market and regulatory innovation, fostering a constructive exchange of experiences and best practices between the two sides.

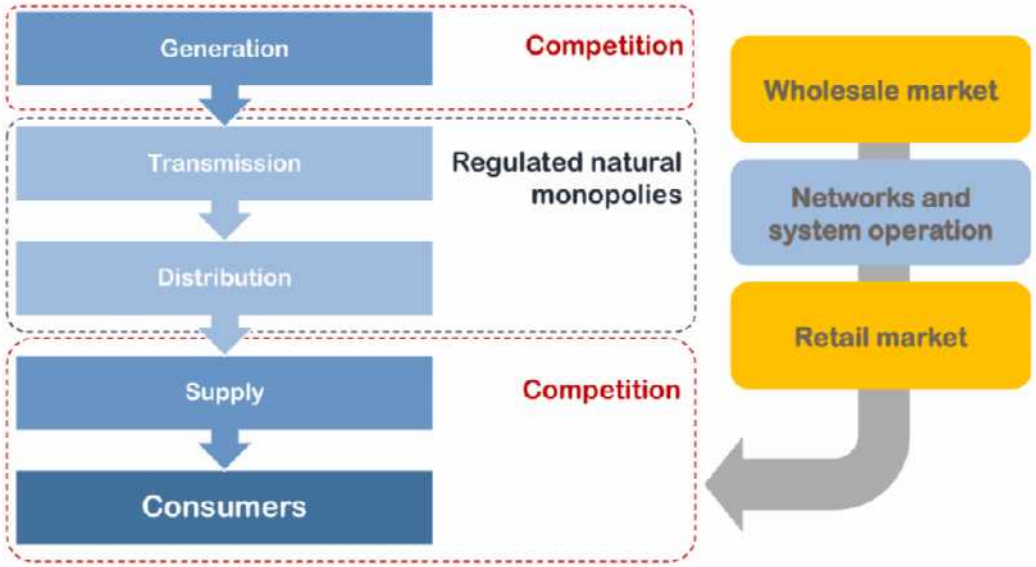
Overview of ERSE powers, responsibilities and legal framework (ERSE)

The Energy Services Regulatory Authority (ERSE) is the national regulatory body responsible for overseeing Portugal's energy sector, covering electricity, natural gas, liquefied petroleum gas (LPG), fuels, and electric mobility. Its core mission is to regulate the sector in the interest of current and future consumers while promoting sustainability and efficient market functioning in the context of the energy transition. ERSE operates with full financial independence, funded through tariffs paid by electricity and gas consumers, contributions from fuel operators, and 40% of collected penalties, without any allocation from the General State Budget; its 2026 budget is approved by the relevant government authorities and amounts to €16,229,100. Functioning within the European Union legal framework, ERSE's independence is supported by key instruments such as the Treaty on European Union, the Treaty on the Functioning of the European Union, and related legislative measures including directives, regulations, and decisions. As an independent National Regulatory Authority (NRA), its establishment is aligned with the liberalization of energy markets, the development of the European internal energy market, and the need for strong regulatory enforcement. ERSE operates within a broader ecosystem comprising European networks of NRAs and specialized EU agencies, ensuring coordinated, consistent, and effective regulation across the European energy sector.



Evolution of the energy sector

Separation of monopolistic and competitive activities



Regulatory impact assessment instruments (ERSE)

ERSE's approach to Regulatory Impact Assessment (RIA) was strengthened following the OECD's PAFER review (2019–2021), which recommended adopting a standardized and systematic framework, expanding the use of ex ante assessments, ensuring consistent internal processes, and incorporating both cost-benefit analysis and ex post evaluation. In response, ERSE established a dedicated RIA Task Unit (EP-AIA) to enhance internal capabilities. Its work focuses on developing a standardized RIA methodology and benchmarking practices across European energy regulators, including contributing to the Guidelines of Good Practice (GGP) in collaboration with CEER.

ERSE developed its internal RIA methodology through a project funded under the European Commission's Technical Support Instrument (TSI) and implemented in collaboration with the OECD. The methodology is designed to integrate RIA across the full regulatory decision-making cycle, supporting both regulatory and non-regulatory decisions, and is tailored to the needs of an independent sectoral regulator. It emphasizes the inclusion of environmental and social considerations alongside economic analysis. The framework is guided by core principles of proportionality where the depth of analysis depends on the significance of impact evidence-based and transparent decision-making, and a comprehensive assessment of costs, benefits, risks, and uncertainties, including comparison with a "do-nothing" scenario. It also adopts a holistic perspective by evaluating economic, social, and environmental impacts, and remains iterative and flexible, allowing analysis to evolve based on new evidence and stakeholder consultation.

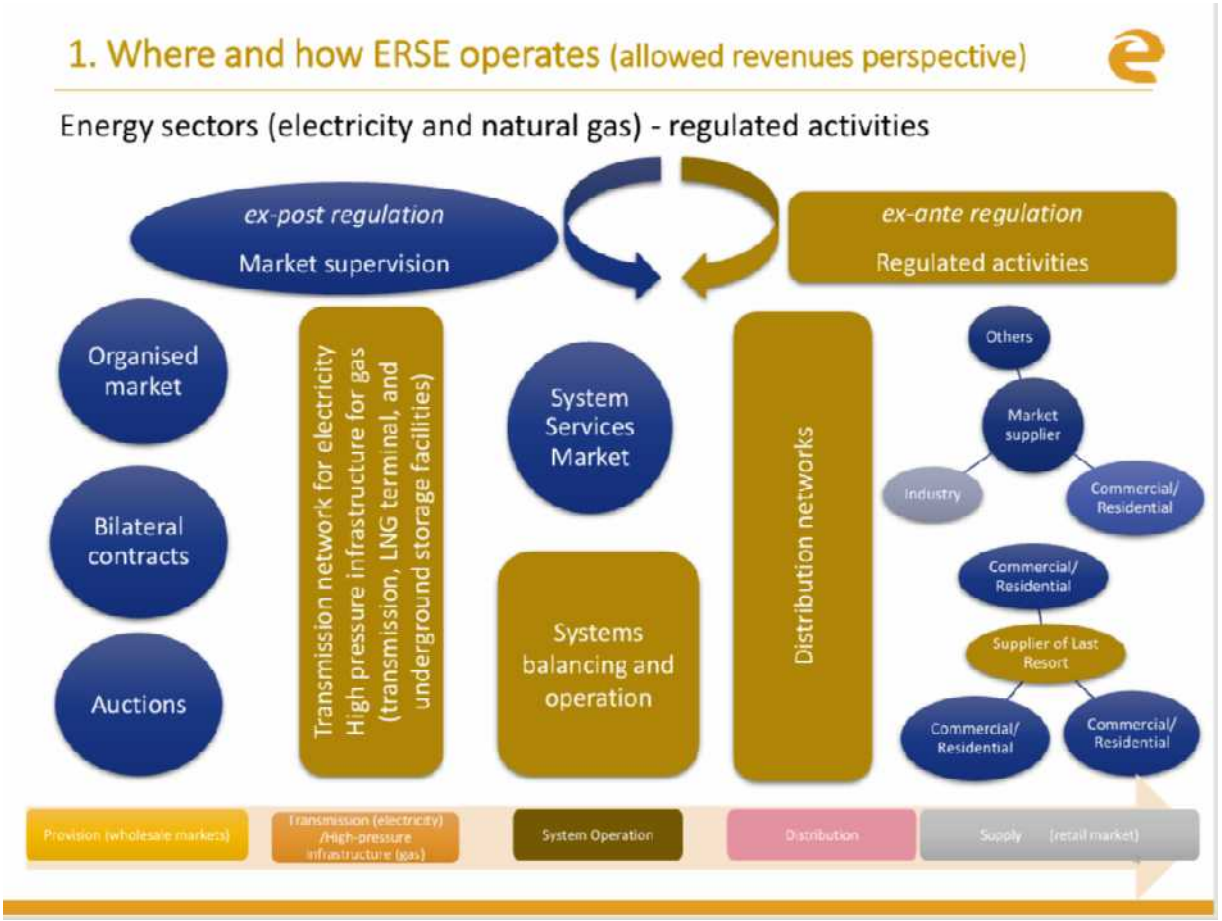
The RIA framework follows a structured yet flexible process designed to support informed and practical decision-making. It typically progresses through key stages, including problem definition, identification of options, assessment, feasibility analysis, and final decision-making. The approach accommodates a range of analytical methods—quantitative, qualitative, or mixed—while maintaining a clear focus on selecting a justified and well-reasoned preferred option rather than conducting analysis for its own sake. It is closely integrated with implementation considerations, addressing feasibility, compliance, enforcement, and monitoring, and promotes continuous learning through evaluation and, where appropriate, experimentation. Embedded within ERSE's regulatory culture, the framework is supported by standardized templates, checklists, and implementation guidance to ensure consistent application across activities. The key steps in the RIA process include screening, problem definition, options identification, appraisal, delivery and feasibility assessment, and the formulation of a decision proposal.

Regulatory Impact Assessment (RIA) within Independent Regulatory Authorities (NRAs) must reflect their distinct institutional position. As independent, non-political bodies, NRAs derive strength from their technical depth and sector-specific expertise, but they also face constraints such as narrow mandates, limited staffing, and restricted budgets. Consequently, RIA frameworks for NRAs should be carefully tailored rather than directly replicated from central ministries, which typically possess broader analytical capacity and access to extensive data. For NRAs, the emphasis should be on precision, robust evidence, and sector-specific impacts, with an approach that is both ambitious and realistic, enabling gradual and sustainable adoption. RIA in this context operates across three key dimensions: as a decision-making and evaluation framework that structures problem identification, option development, and justification of choices while enhancing consistency, transparency, and accountability; as a tool for systematic information gathering that leverages sectoral knowledge and external collaboration; and as a mechanism for early and continuous stakeholder engagement, involving industry, consumers, and experts to strengthen accountability and improve the quality of evidence. Overall, effective RIA implementation in NRAs depends on a proportionate, evidence-based, and transparent approach, supported by strong internal systems that promote quality and learning, ultimately enhancing regulatory credibility, accountability, and public trust, and leading to better decisions, improved governance, and more effective outcomes for consumers and markets.

Regulatory framework for network tariffs and quality of supply

In the subsequent session, ERSE presented its regulatory framework for network tariffs and quality of supply, focusing on the methodologies used to define allowed revenues and set efficiency parameters for regulated entities. The discussion also covered the mechanisms for defining, monitoring, and enforcing quality of service standards, including the use of performance-based incentives to ensure reliability, accountability, and continuous improvement in service delivery.

Allowed revenues and efficiency parameters



1. Where and how ERSE operates (allowed revenues perspective)

ERSE competencies

Opinions on investment and development plans for electricity and gas networks

Regulatory/Codes	Regulation and Supervision	Advisory	Sanctioning
• Drawing up and approving the regulations necessary for the fulfilment of its duties	• Establishing tariffs for regulated activities • Supervising and inspecting operation of regulated sectors	• Issuing opinions required by law • Other opinions requested by: Government, Parliament, Competition authority (AdC), Directorate-General (DGEG)	• Entities involved in regulated sectors are subject to ERSE's sanctioning powers

- Calculate allowed revenues of regulated activities, which allow costs of these activities to be borne under conditions of efficient management
- Calculate tariffs to recover the allowed revenues/profits

- Tariffs Code (electricity sector and gas sector), which establishes the regulatory methodologies by activity and principles for tariff structure

5

1. Where and how ERSE operates (allowed revenues perspective)

Regulatory action to set prices of regulated tariffs (2/2)

Allowed revenues and network tariffs are set annually (15 December for electricity 31 May for natural gas)

Allowed revenues	Network tariffs	Demand
• Application of regulation methodologies for each activity • Forecast of variables that influence revenues (physical, macroeconomic) • Include adjustments of revenues from previous years	• Depend on the type of regulated service (transmission, distribution, system management) • Tariffs structure varies by types of consumer and tariff options • Physical billing variables (energy, capacity, peak power, different prices by time-of-use)	• Forecast of variables for tariffs invoicing (energy, power, peak power, time-of-use)

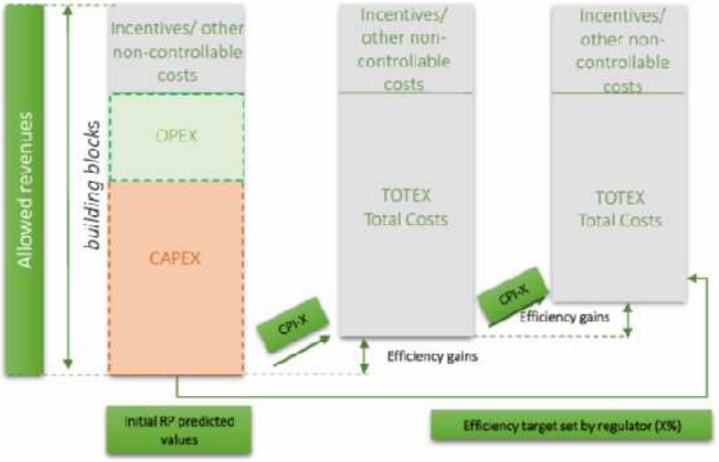
$$\text{Network Tariffs} = \frac{\text{Allowed revenues}}{\text{Demand}}$$

Efficiency parameters - latest DSO benchmark example: The latest Distribution System Operator (DSO) benchmarking framework defines allowed revenues over a regulatory period using a revenue cap approach applied to total controllable costs (TOTEX), with the objective of aligning operators with an efficiency frontier that reflects optimal performance levels. Allowed revenues are derived from a combination of fixed and variable cost components, adjusted annually through inflation (IPC) and an efficiency factor (X), thereby incentivising cost reductions over time while maintaining service quality.

2. Regulatory methodologies applied to allowed revenues (ERSE's TOTEX light approach)

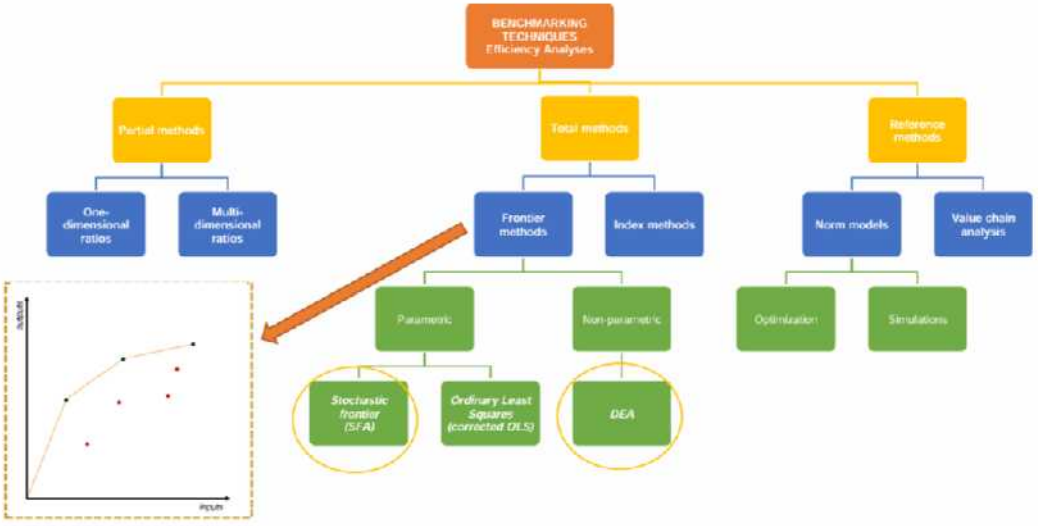
TOTEX implementation

- The Portuguese approach is closer to a revenue cap than to a pure TOTEX approach (like Ofgem's FOCS approach).



3. Efficiency parameters - latest benchmark example

Benchmarking Techniques to evaluate efficiency



Efficiency performance is assessed by comparing allowed revenues with actual unit costs, typically expressed in EUR/MWh, to track convergence towards efficient cost levels. In contexts such as mainland Portugal, where there is effectively a single DSO, benchmarking relies on international comparisons; for instance, in 2025, ERSE conducted a European benchmarking exercise—building on its 2021 analysis for the 2022–2025 regulatory period to estimate efficient cost levels and set corresponding efficiency targets for E-REDES. This process involves significant data and methodological challenges, including the collection of consistent physical and economic data from DSOs via their National Regulatory Authorities in coordination with the Council of European Energy Regulators, the exclusion of highly discretionary costs influenced by national or operator-specific policies, and the harmonisation of economic variables through purchasing power parity adjustments and constant price normalization to ensure cross-country comparability.

Portuguese Electricity Sector and Quality of Service Framework

During the visit, the speaker provided a comprehensive overview of the structural transformation of the Portuguese electricity sector. Prior to 1996, the sector operated as a vertically integrated, state-owned monopoly, where consumers had no choice of supplier and tariffs were fully regulated.

Post-1996 reforms introduced market liberalization, resulting in an unbundled structure. Generation and supply segments became competitive, while transmission and distribution continued as regulated natural monopolies. These reforms enabled third-party access to the grid and allowed consumers to choose their electricity suppliers, significantly enhancing market efficiency and consumer empowerment.

The session also covered the regulatory framework governing service quality, defined under the Quality of Service Code (QSC) for both electricity and gas sectors. Service quality is assessed across two key dimensions: commercial quality and technical quality. Commercial quality relates to customer-facing responsibilities such as communication, customer service, and contract management. Technical quality focuses on continuity of supply and power quality parameters, including voltage variations, frequency stability, flicker, and harmonic distortion.

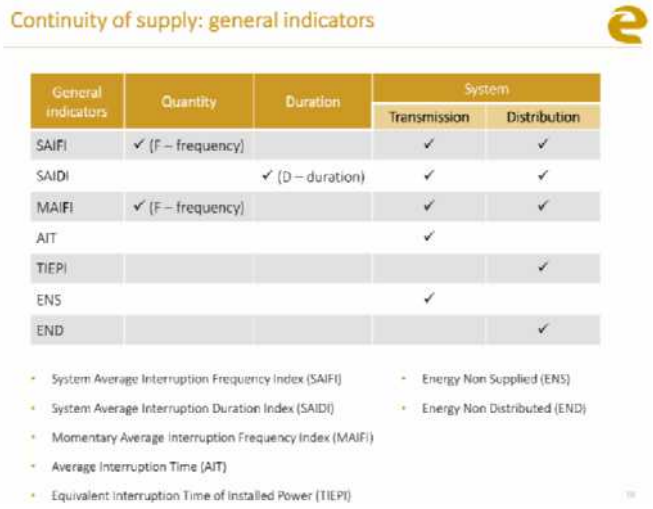
Continuity of supply was highlighted as a critical performance indicator from the consumer's perspective. It is evaluated using individual indicators such as the number and total duration of interruptions experienced annually by each consumer, considering only long interruptions (greater than three minutes). Interruptions are categorized as:

- Long interruptions: exceeding 3 minutes
- Short interruptions: between 1 second and 3 minutes
- Planned interruptions: scheduled with prior notice
- Unplanned interruptions: caused by faults without prior notice

For planned interruptions, strict service standards apply. These include a maximum of five interruptions per customer per year, each not exceeding eight hours, along with a minimum notice period of 36 hours communicated through appropriate channels.

The concept of Quality of Service (QoS) zones was also introduced, where consumers are grouped based on geographic and demand characteristics:

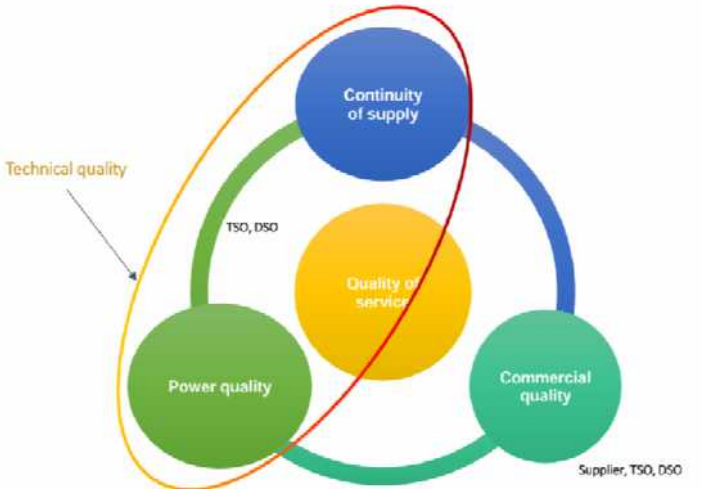
- Zone A: Urban areas with more than 25,000 customers
- Zone B: Semi-urban areas with 2,500–25,000 customers
- Zone C: Rural areas



Continuity of supply: general indicators

General indicators	Quantity	Duration	System	
			Transmission	Distribution
SAIFI	✓ (F – frequency)		✓	✓
SAIDI		✓ (D – duration)	✓	✓
MAIFI	✓ (F – frequency)		✓	✓
AIT			✓	
TIEPI				✓
ENS			✓	
END				✓

- System Average Interruption Frequency Index (SAIFI)
- System Average Interruption Duration Index (SAIDI)
- Momentary Average Interruption Frequency Index (MAIFI)
- Average Interruption Time (AIT)
- Equivalent Interruption Time of Installed Power (TIEPI)
- Energy Non Supplied (ENS)
- Energy Non Distributed (END)



Higher-density areas are subject to more stringent quality standards.

The speaker further emphasized that network operators must implement Service Quality Improvement Plans when performance falls below prescribed standards. These plans are integrated into broader network development strategies and are subject to regulatory review and government approval.
To ensure accountability, consumers are entitled to automatic compensation in cases of non-compliance with service standards. Compensation is calculated based on either the number or duration of interruptions (whichever is higher) and is credited directly to electricity bills without requiring consumer claims.
Additionally, regulatory incentives are provided to Distribution System Operators (DSOs) to enhance system performance, with particular focus on medium-voltage customers and poorly served areas.
The session also highlighted the importance of power quality monitoring. Network operators are required to implement structured monitoring plans—either continuous or periodic—typically over a two-year cycle. These plans ensure adequate geographic coverage and focus on areas prone to power quality issues.
Finally, both network operators and suppliers are mandated to publish annual Quality of Service Reports and submit them to the regulator by May each year. The regulator consolidates these submissions into a national-level report, ensuring transparency and accountability.

Market and regulatory innovation

Smart networks, decentralised energy and market tools
During the visit, the speaker emphasized that integrating high shares of Variable Renewable Energy (VRE), such as wind and solar, requires a fundamental transformation in power system design, operation, and planning from both technical and economic perspectives.

Key Learnings:

- **Challenges of VRE Integration:**
  - Dependence on resource availability (solar/wind).
  - High variability and unpredictability of generation.
  - Limitations in forecasting accuracy.
  - Increased reliance on power electronics (DC/AC conversion).
  - High fixed infrastructure costs.

- **System-Level Constraints:**
  - Managing resource scarcity and surplus through ancillary services.
  - Need for flexibility and energy storage solutions.
  - Grid challenges such as congestion and reverse power flows.
  - Maintaining voltage and frequency stability.
  - Reduced system inertia with higher renewable penetration.
  - Limited visibility and control of behind-the-meter generation.

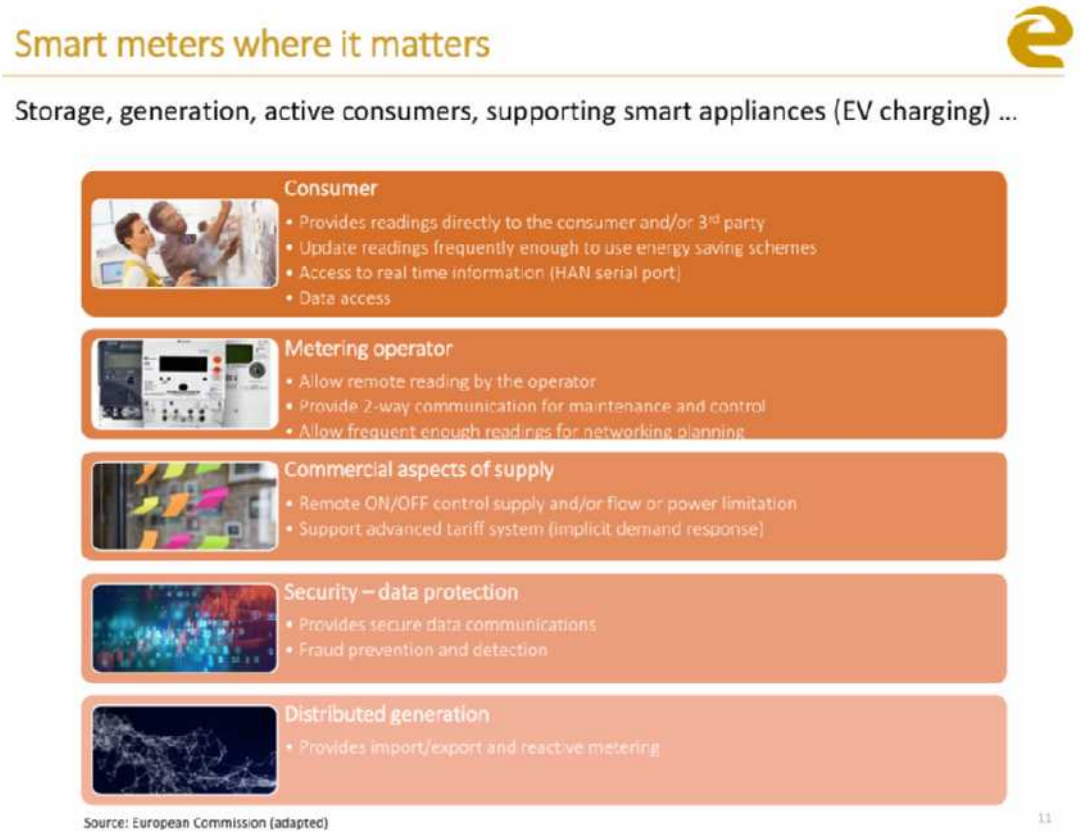
- **Key Technical and Operational Solutions:**
  - Hybrid energy systems (e.g., wind, solar, storage combinations).
  - Flexible demand, especially through electric vehicles.
  - Improved forecasting tools and technologies.
  - Flexible generation for ancillary services.
  - Use of Virtual Power Plants (aggregation of distributed resources).
  - Expansion of energy storage (hydrogen, pumped hydro, batteries).
  - Promotion of self-consumption and decentralized generation.
  - Strengthening interconnections and modernizing grid infrastructure.

- **Smart Grids as a Core Enabler:**
  - Enable bidirectional flow of energy and data.
  - Support real-time monitoring, control, and dynamic grid management.
  - Facilitate integration of decentralized and renewable energy sources.
  - Ensure system reliability and power quality.
  - Enable active consumer participation in energy systems.

- **Role of Smart Meters:**
  - Provide accurate measurement of consumption and generation.
  - Enable real-time data communication and system monitoring.
  - Support informed decision-making and demand-side management.

- **Regulatory and Market Support (ERSE Framework):**
  - Smart Grid Services Code enables advanced digital services.
  - Daily remote meter readings and 15-minute interval data access.
  - Billing based on actual consumption (no estimates).
  - Remote modification of contracted power.
  - Consumption alerts and improved user engagement.
  -

- **Performance Monitoring (SGKPIs):**
  - Remote monitoring and control of networks and users.
  - Asset management and grid planning optimization.
  - Reduction of technical losses.
  - Improved supply reliability and service continuity.
  - Integration of distributed resources and flexibility services.
  - Enhanced cybersecurity and data management.



The session highlighted that **smart grids, supported by digitalization, regulatory frameworks, and advanced market tools**, are essential for managing the complexity of VRE integration and for building a flexible, reliable, and sustainable power system.

Decentralized Energy and Grid Challenges

During the visit, the speaker explained that despite strong progress in renewable energy deployment, significant challenges persist, particularly related to grid capacity, congestion, and system integration.

Key Learnings:

- **Grid Capacity Constraints:**
  - Renewable energy capacity is growing, but targets for 2025 and 2030 remain challenging.
  - Transmission network capacity is limited, with only ~2.6 GVA planned for 2028–2030.
  - Although the distribution network has relatively higher capacity (~7 GVA), it is constrained by upstream transmission limitations (~6 GVA), restricting new connections.

- **Need for System Flexibility:**
  - Flexibility is critical to balance supply and demand in renewable-heavy systems.
  - Key resources include distributed generation, self-consumption, storage, microgrids, electric vehicles, and smart appliances.
  - Hybrid power plants (wind/solar/storage combinations) improve utilization of existing grid infrastructure.
  - Virtual Power Plants and aggregators enable better coordination of distributed resources.
  - Industrial and commercial consumers play a key role due to their high flexible demand potential.

- **Role of Decentralized Energy Systems:**
  - Distributed Energy Resources (DERs) support localized generation and reduce dependence on centralized grids.
  - Technologies include renewable generation, electric vehicles, heat pumps, and battery storage.
  - Promotes a localized “proximity economy” for energy.

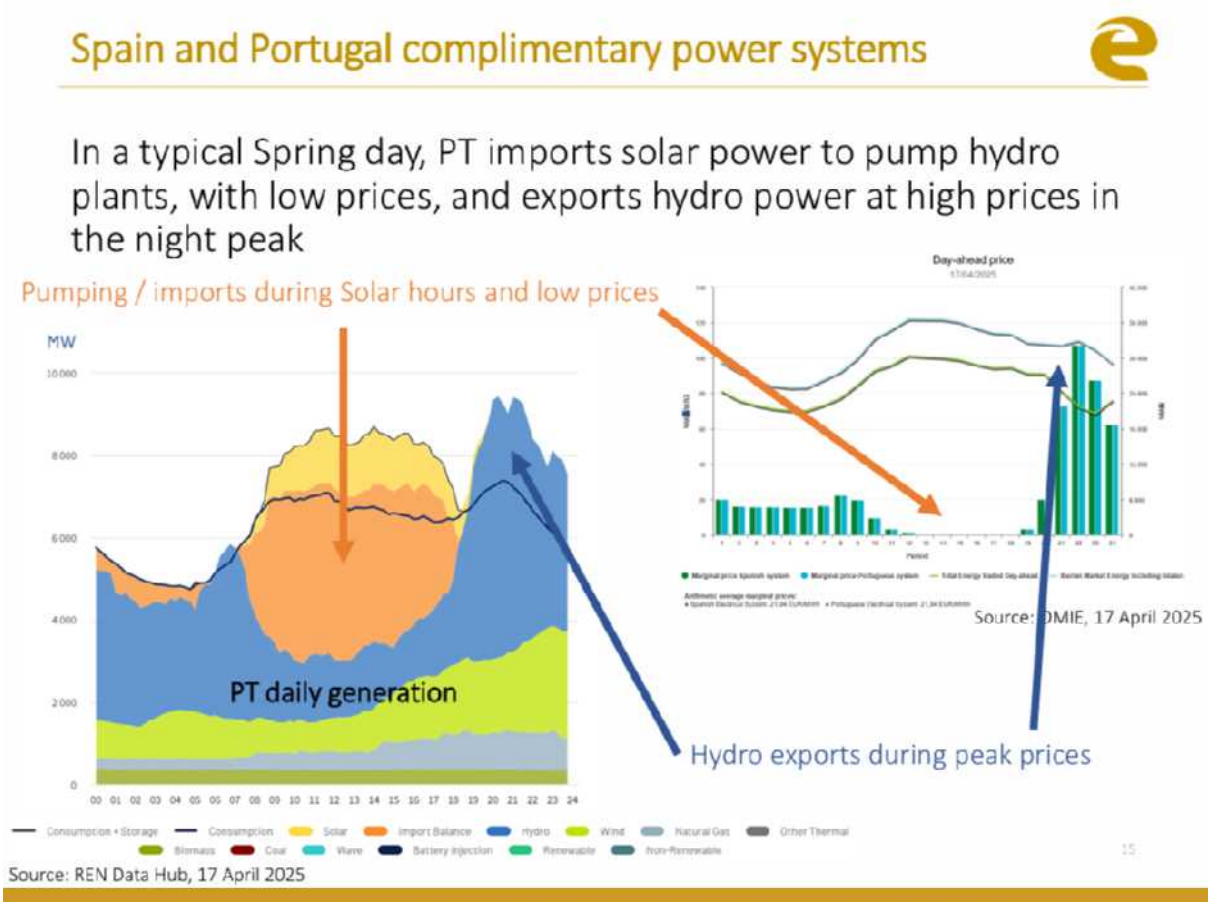
- **Energy Efficiency and Electrification:**
  - “Energy efficiency first” is a guiding principle.
  - Electrification enables more efficient and direct use of renewable energy sources.

- **Importance of Digitalization:**
  - Full rollout of smart meters enables real-time monitoring, control, and consumer participation.
  - Digital tools improve system optimization and operational efficiency.

- **Hybrid Power Plant Innovations:**
  - Floating solar projects (e.g., Alto Rabagão and Alqueva) demonstrate integration of hydro, solar, and storage.
  - Benefits include improved efficiency, optimized resource use, and reduced environmental impact.
  - Innovative materials (e.g., low-carbon floating structures) further enhance sustainability.

- **Growth of Self-Consumption Models:**
  - Enables consumers to generate and use their own renewable energy.
  - Benefits include cost savings, reduced grid dependence, net metering, and selling excess power.
  - Adoption levels (Q3 2025): ~26% of medium-voltage consumers and ~4% of households.
  - Simplified regulations and standardized grid connection processes have accelerated uptake.

- **Critical Role of Energy Storage:**
  - Storage systems (behind-the-meter and grid-connected) enhance flexibility and grid stability.
  - Supports higher renewable penetration and demand balancing.
  - Enables both individual and collective self-consumption models.



The session highlighted that **decentralized energy systems, supported by flexibility, storage, digitalization, and enabling policies**, are essential to overcome grid constraints and ensure a resilient, efficient, and sustainable energy transition.

Market Tools

During the visit, the speaker explained how market-based tools and regulatory mechanisms are increasingly being used to manage grid constraints and enable flexibility in modern power systems. Key insights include:

- **Flexibility-Oriented Planning:**
  Network development planning is evolving to incorporate flexibility solutions—such as energy storage, demand response, and distributed generation—as cost-effective alternatives to traditional grid expansion, supported by cost-benefit analysis.
- **Role of DSOs in Flexibility Procurement:**
  Distribution System Operators (DSOs) actively promote flexibility services. In Portugal, a pilot project (FIRMe) has been implemented to procure flexibility from market participants to address grid congestion efficiently.
- **Modernization of Grid Codes:**
  Updated grid codes require Distributed Energy Resources (DERs), particularly rooftop solar (PV), to include advanced inverter functionalities such as voltage and frequency ride-through and voltage regulation, enhancing grid stability.
- **Preparing for System-Level Challenges:**
  Increasing penetration of decentralized energy may reduce system inertia and operational demand, requiring proactive planning and integration of new technologies to maintain system reliability.

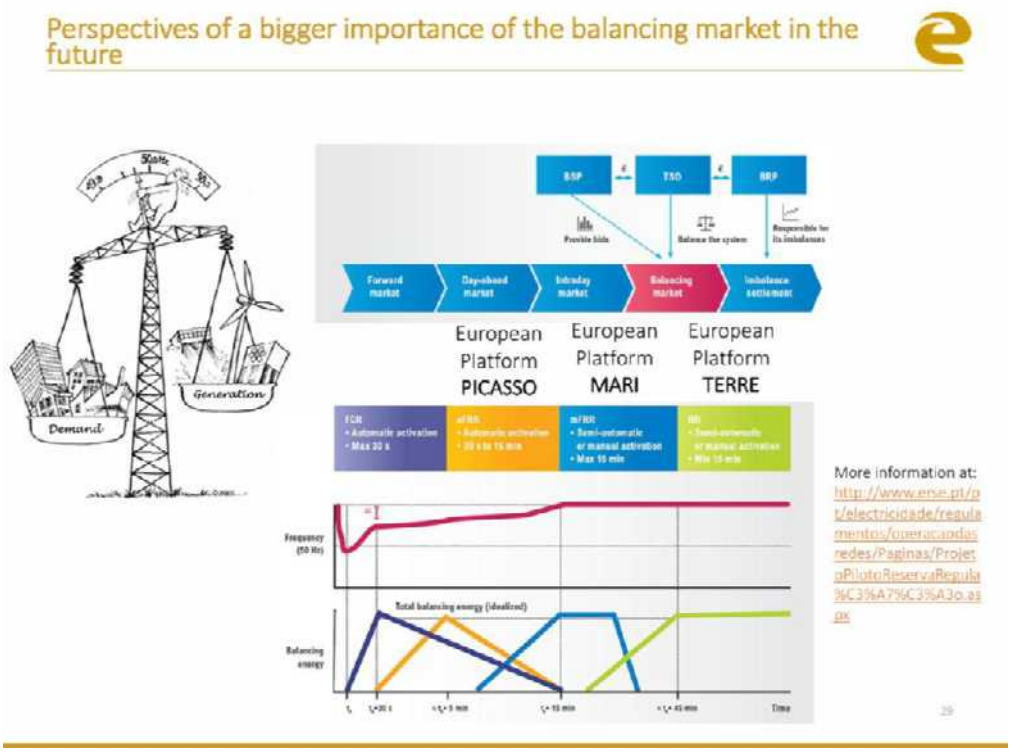
- **Flexible Grid Connection Models:**
  Introduction of flexible connection agreements allows generators and consumers to connect to the grid under defined conditions, optimizing network utilization without requiring immediate infrastructure upgrades.

- **Digital Platforms and Data Transparency:**
  DSOs provide centralized service portals offering detailed information on electricity consumption, generation, and network capacity, improving transparency and user engagement.

- **Advanced Metering and Data Access:**
  Consumers and stakeholders can access:
  - Daily meter readings by tariff period (consumption and injection)
  - 15-minute interval load data (up to 24 months history)
  - Monthly maximum demand data
  - Historical data records (up to 36 months)

- **Comprehensive Data Hub:**
  The system integrates diverse datasets, including:
  - Consumption data at hourly and regional levels
  - Network information (public lighting, contracts, active connections, hosting capacity)
  - Electric mobility infrastructure (charging stations, new connections)
  - Renewable energy adoption (self-consumption units and capacities)

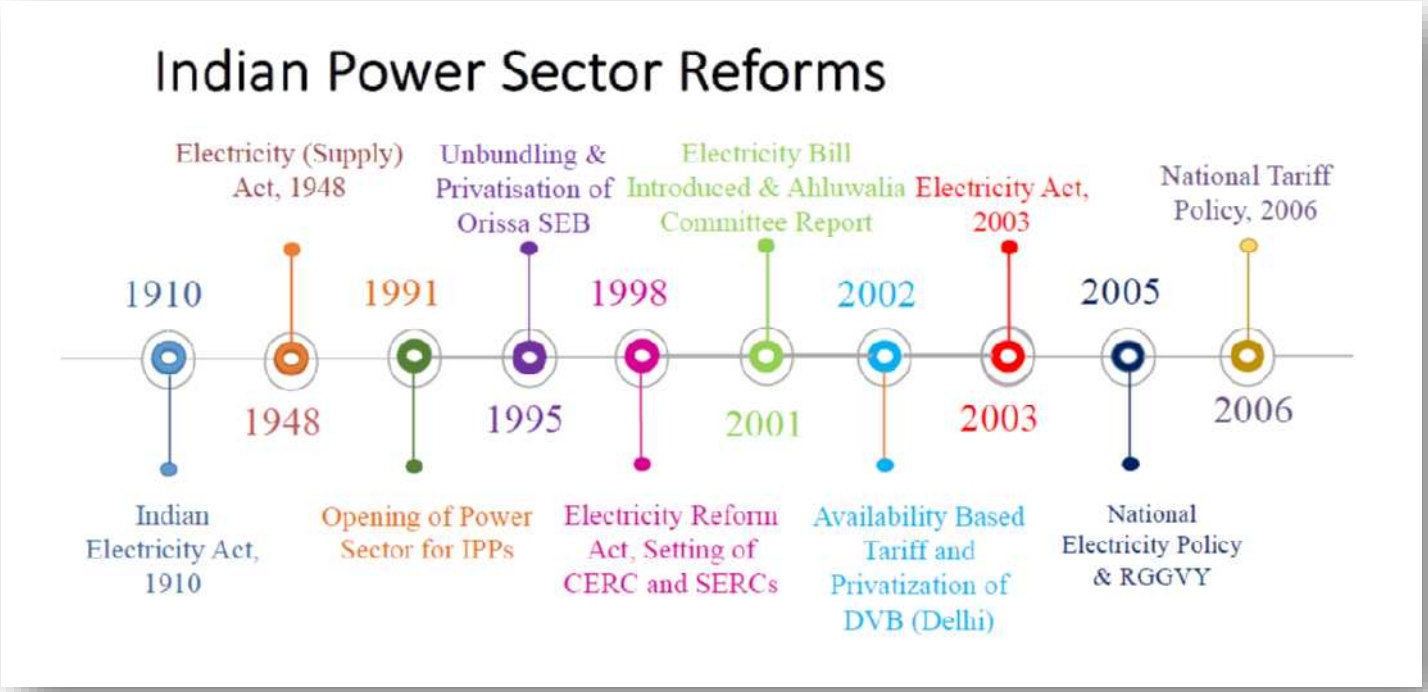
- **Operational Monitoring and Service Quality:**
  Key performance indicators include service continuity, outage tracking, remote metering coverage, load profiling, and digital work order management.



The session demonstrated that **market tools, digitalization, and data-driven decision-making** are essential for enabling flexibility, optimizing grid utilization, and supporting the large-scale integration of renewable energy in a reliable and economically efficient manner.

Overview of market and regulatory framework in India (CER)

Delegates of the 5th GRPP from the Centre for Energy Regulation delivered a comprehensive session on regulatory governance and market evolution in the Indian power sector, highlighting CER's role as a policy and regulatory think tank supporting sectoral reforms. The presentation traced the evolution and restructuring of the Indian power sector, outlining its institutional framework, regulatory governance structure, and approaches to tariff determination. It also covered India's progress in renewable energy, including its net-zero commitments (base year 2005), the evolution of Renewable and Renewable Consumption Obligations (RPO/RCO), and the growing role of competition in bulk power markets through exchange-traded products. The session further emphasized emerging developments such as smart grid initiatives and the increasing integration of technology and market-based mechanisms in shaping a modern, efficient, and sustainable power sector.

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Day 3: Session Highlights

Site visit to Tratolixo (Urban Waste Treatment Facility)

The industrial visit to the Tratolixo waste management system, serving the Cascais, Mafra, Oeiras, and Sintra regions, provided a comprehensive understanding of advanced anaerobic digestion (AD) and integrated waste valorization practices. The facility processes approximately 511,548 tonnes of municipal solid waste annually (2025 data), equivalent to 1.54 kg per capita per day, with a strong emphasis on decarbonization, resource recovery, and circular economy principles.

Governance and Operational Framework:
The effectiveness of the system is driven by a well-defined institutional structure and clear division of responsibilities:

- Public Participation: Waste management begins at the household level through source segregation.
- Municipal Role: Local municipalities are responsible for waste collection and transportation, acting as the critical link between citizens and the facility.
- Tratolixo Operations: The facility handles waste reception, sorting (mechanical and manual), biological treatment, and final recycling or disposal.
- Strategic Oversight (CAPER): A monitoring committee ensures alignment with long-term waste management goals and oversees implementation efficiency.

Strategic Evolution (2003–2025 Trends)
The facility demonstrates significant progress in improving waste management practices:

- Selective Collection: Currently accounts for 24% of total waste, with continued efforts to reduce the 76% undifferentiated waste stream.
- Biowaste Potential: Approximately 55% of undifferentiated waste is organic, indicating substantial scope for enhanced energy recovery through improved segregation at source.

The anaerobic digestion (AD) unit is the core of the facility's energy recovery system, where pre-treated waste after removal of inert materials like glass and stones and recovery of recyclables such as iron and aluminum is processed in three digesters, each with a capacity of 3,700 m^3 and a retention time of about 45 days. The process yields approximately 20% biogas and 80% digestate, with a key design innovation being biogas-based mixing that eliminates internal mechanical components, thereby reducing maintenance requirements and improving reliability. The generated biogas, containing around 58% methane, is used for power generation through three engines of 1,350 kWh capacity each, while ongoing expansion efforts aim to enhance gas production and enable biomethane (RNG) generation for grid injection and use as a transport fuel.

Impact and Circular Economy Outcomes: The facility acts as a massive recovery hub, diverting significant volumes of waste from landfills:

Category	Volume / Impact	Application
Energy Generation	**20 GWh**	Powers **15,000 people** continuously via the national grid.
Green Compost	**21,784 tons**	Certified for **organic farming** use.
Standard Compost	**7,602 tons**	Applied in vineyards, olive groves, and orchards.
Paper & Card	**16,410 tons**	Recycled into new paper products.
Plastic & Metal	**13,205 tons**	Circular material recovery.
Glass	**13,127 tons**	Infinitely recyclable without quality loss.
Specialized Waste	**6,956 tons**	Includes E-waste, batteries, and cork.

Key Learnings from the Industrial Visit

The interaction with facility experts provided several practical insights relevant to waste-to-energy systems, particularly for application in India:

- Demonstrated its viability for decentralized electricity generation and biomethane production, aligning with India's SATAT initiative.
- High organic content in mixed waste highlights the need for improved segregation to maximize energy recovery.
- "Green compost" plays a crucial role in organic farming and soil health improvement.
- AD systems can be expanded in phases, making them suitable for growing urban centers.
- Digesters without internal moving parts significantly reduce operational costs and improve reliability.
- The CAPER framework provides a strong example of effective coordination between stakeholders.
- Investments exceeding €10 million in biomethane production reflect a forward-looking transition toward renewable energy systems.

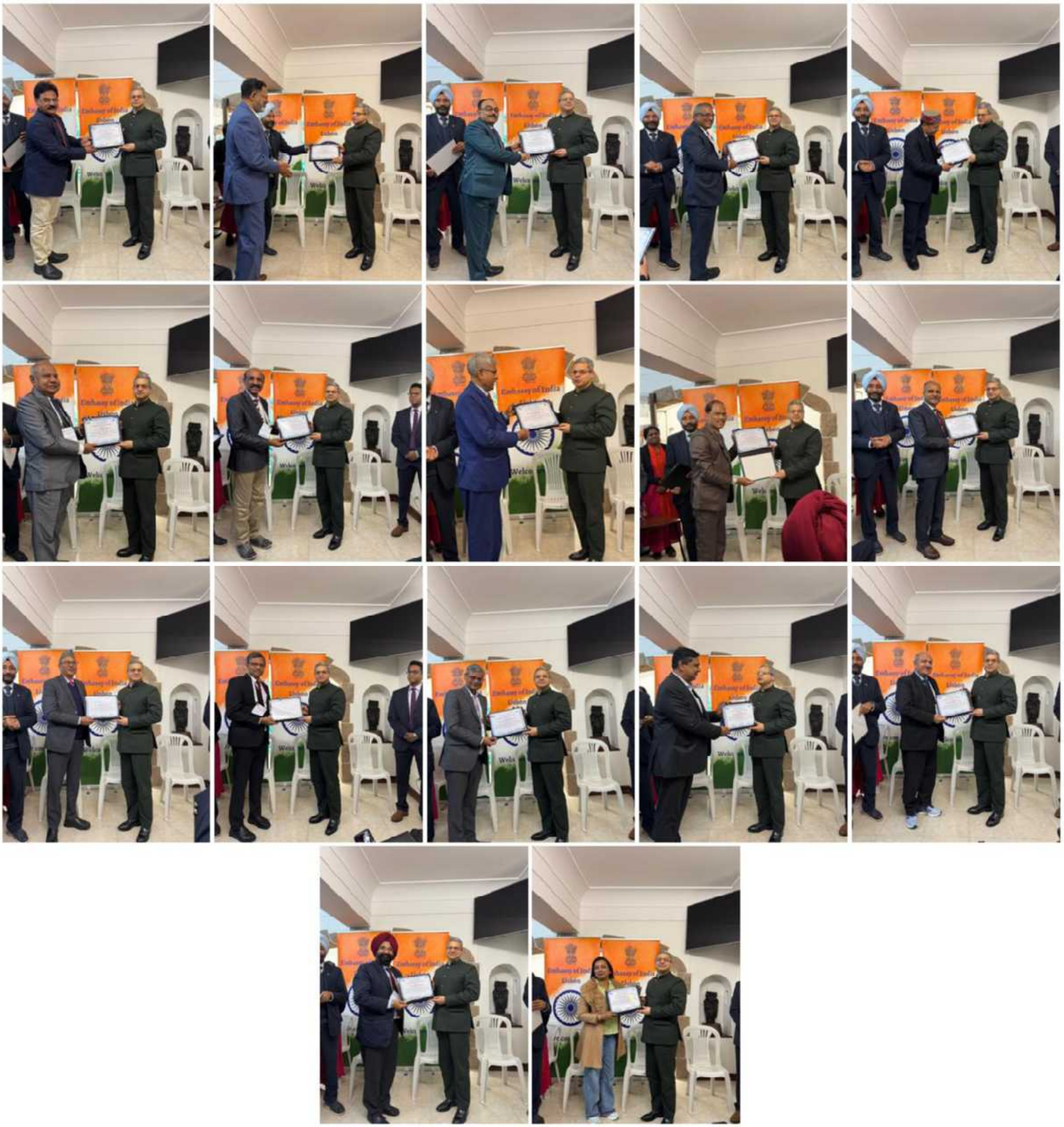
The visit offered valuable exposure to a mature, efficient, and scalable waste-to-energy model. The integration of technology, governance, and circular economy principles demonstrates a practical pathway for sustainable waste management. The insights gained are highly relevant for replication in the Indian context, particularly in developing low-maintenance, modular, and resource-efficient waste treatment systems.

Valedictory Session

The valedictory session commenced with a welcome address by Ambassador Puneet R. Kundal, Ambassador of India to Portugal, Embassy of India, Lisbon. In his remarks, he provided a concise historical perspective on the longstanding relationship between India and Portugal, highlighting its evolution and continued relevance in the contemporary context. He further delivered an insightful overview of Portugal, presenting key aspects of the country and underscoring the strong bilateral ties between the two nations. This was followed by Prof. Anoop Singh, who provided an overview of the 5GRPP programme, outlining its objectives, structure, and overall significance.

Group photograph of the Centre for Energy Regulation (CER) team with dignitaries (left to right): Ms. Asha Antony, Counsellor & Head of Chancery, Embassy of India, Lisbon; Dr. Himanshu Anand, Project Executive Officer, CER & EAL, IIT Kanpur; Prof. Anoop Singh, Professor at IIT Kanpur and Founder of CER–EAL, IIT Kanpur; H.E. Shri Puneet R. Kundal, Ambassador of India to Portugal, Embassy of India, Lisbon; and Mr. Ronnie E. Spurgeon, First Secretary (Commerce & Consular), Embassy of India, Lisbon.

Prof. Anoop Singh expressed his sincere appreciation to the Centre for Energy Regulation team for their contributions to coordination, event management, and the effective organization of the programme. He commended Himanshu, Muskan, and Vivek as core team members for their significant roles in report preparation, management, and the overall execution of the CBP. He also acknowledged Garima for her valuable support in IT services.



Delegation Feedback Analysis Report

Programme Evaluation Summary

1. Overall Feedback of the Program

Question	Average Score	Minimum Score	Maximum Score
1	4.53	4.00	5.00
2	4.35	4.00	5.00
3	4.57	4.00	5.00
4	4.39	4.00	5.00

2. Question Key

S. No	Feedback on
1	Scope of the topic
2	Technical Depth of the presentation
3	Response to your questions
4	Overall rating of the session

3. Session-Wise Feedback

Day 1 – Average Score

Question	Session I Site visit to EDP Labelec	Session II Site visit to Endesa
4	4.3	4.3

3. Session-Wise Feedback

Day 1 – Average Score

Question	Session I Site visit to EDP Labelec	Session II Site visit to Endesa
4	4.3	4.3

Day 2 – Average Score

Question	Session I Regulatory governance and market design	Session II Regulatory framework for network tariffs	Session III Market and regulatory innovation
1	4.6	4.5	4.2
2	4.3	4.4	4.3
3	4.7	4.5	4.4
4	4.5	4.5	4.4

Day 3 – Average Score

Question	Session I Site visit to Tratolixo
4	4.4

IIT Kanpur: Indian Institute of Technology Kanpur

IIT Kanpur's lead on Regulatory and Policy Research, and Energy Sector Modelling and Analytics

Centre for Energy Regulation

Energy Analytics Lab

Department of Management Sciences
Indian Institute of Technology Kanpur

About
Centre for Energy Regulation (CER)
and
Energy Analytics Lab (EAL)

About Centre for Energy Regulation (CER)

The Centre for Energy Regulation (CER) is an endeavor towards comprehensive and sustained institutional strengthening in the Indian power sector. It is an initiative led by the Department of Management Sciences at Indian Institute of Technology Kanpur (IITK), which has been actively engaged in education, research, capacity building, consulting and policy advisory related to energy/power sector. Centre for Energy Regulation (CER) was set up in 2017, through seed funding by the UK Government through the project on "Strengthening Regulatory Research & Network in the Power Sector". The Centre work in close cooperation with key stakeholders in the Indian power sector, particularly the Electricity Regulatory Commissions (ERCs), electric utilities and academia.

Verticals of CER

Regulatory & Policy Research

Capacity Building

Regulatory Knowledge Base

Regulatory Research Areas

The CER engages in regulatory research and policy analysis covering a wide variety of current as well as emerging issues, particularly in the context of the Indian power sector. The key research focus areas are power market development, resource adequacy, RE integration, tariff regulations, regulatory governance, etc.

Regulation and Policy	Power Market Development	RE Integration and Smart Grid
• Regulatory governance • Tariff determination framework for generation, transmission, and distribution • Performance benchmarking for electricity distribution utilities • Incentive design for performance • Transmission access and transmission pricing • Energy transition and climate policy modelling • Distributed energy resources/peer to peer market • Determination of cost of capital /return on equity	• Resource adequacy • Long-term demand forecasting • Market simulation modelling • Demand side management • Cross border trading of electricity • Power Market Derivatives • Market based economic dispatch (MBED) • Security Constrained Economic Dispatch (SCED) • Deviation settlement mechanism • Ancillary services market • Distribution System Operators (DSOs) • Market monitoring analytics • Electric vehicle (EV) and modelling of EV charging • Market based PPAs	• RE and storage modelling • Renewable energy policy modelling • Flexibility • Renewable power obligation (RPO) • Renewable energy certificate (REC) mechanism • Design and sizing of mini grid programs • Rooftop solar • Green hydrogen • Smart meter tariff design • Smart grid and mini grid policy • Indian carbon market • Energy saving certificates (ESCerts)

CER's Key Institutional Collaborations

S.No.	Research Assignments	Stakeholder
1	Policy research to Identify Interventions for Reducing Disputes in the Indian Power Sector	विद्युत मंत्रालय MINISTRY OF POWER
2	Normative Tariff Framework for Tariff Determination of Inter-State Generating Stations for the Control Period of 2024-29	CERC
3	Development and Management of Regulatory Tool	Forum of Regulators
4	Improving the Effectiveness of Regulatory Framework in Electricity Sector	NITI Aayog
5	Developing Energy-Economy-Environment Policy Modelling: MESSAGEix for climate energy regulatory policy	NITI Aayog
6	US India collaborative for Smart Distribution System with Storage	US-ASSIST
7	Regulatory Framework for Long-Term Demand Forecasting and Power Procurement Planning	Electricity Regulatory Commission
8	Long-term Demand Forecasting and Power Procurement Planning	CSERC
9	Developing Power Market Derivatives for the Indian Power Market	International Sustainable Energy Foundation
10	Rajasthan Energy Scenario for 2030 and 2050	SED Fund
11	Analysis of Market Bid Data for Market Monitoring	CERC

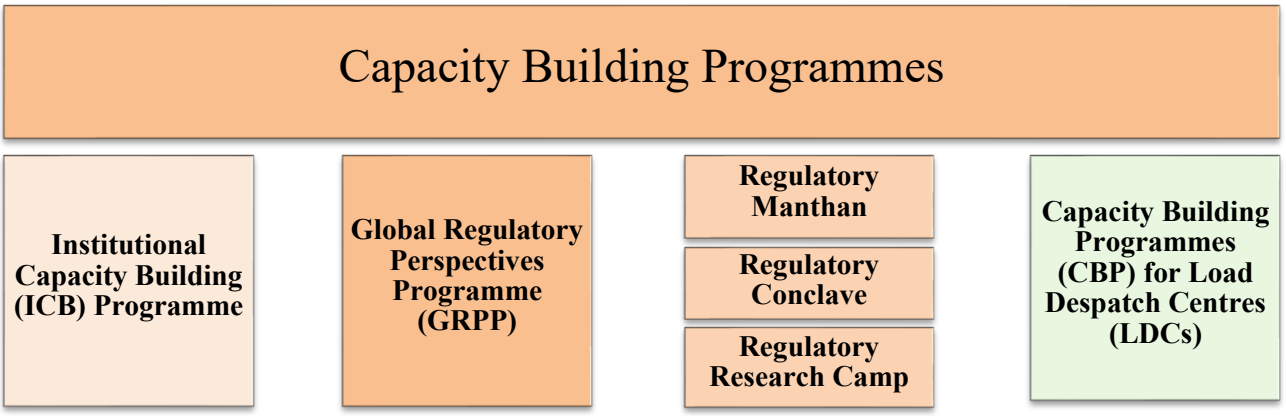
A number of public institutions and government bodies, both at national and international levels, have shown their confidence in CER, along with EAL, in entrusting analytical, modelling, regulatory and policy-based assignments.

The outcome of the above research studies have effectively contributed in shaping the policy and regulatory initiatives in Indian respective context as it strengthen CER ability to contribute to wider experience across the sector. CER expects to continue to engage in relevant activities with support from entities having interest in energy/power sector.

Capacity Building Programmes

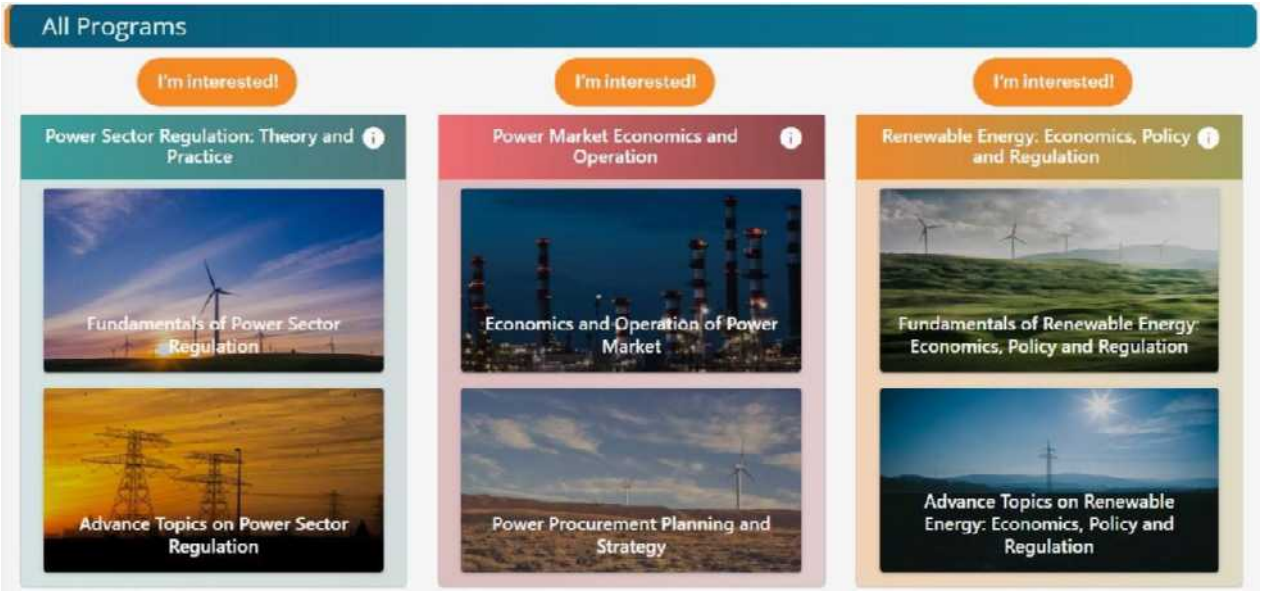
CER regularly conducts both offline and online programmes to engage with a wide range of stakeholders through tailored capacity-building programmes (CBPs) and stakeholder consultations. The design of individual programmes varies from a few hours to several weeks, depending on the programme objectives, scope, target audience, depth of engagement, and hands-on activities.

Regular engagement with key stakeholders, through such programmes, has ensured that the sector's need for skilled human resources are addressed from time to time. A proud alumni of more than 1,000 professionals, researchers, and students stands as a testament to IIT Kanpur's leadership in regulatory and policy aspects of the energy/power/infrastructure sectors.



Regulatory Certification Programmes (RCP)

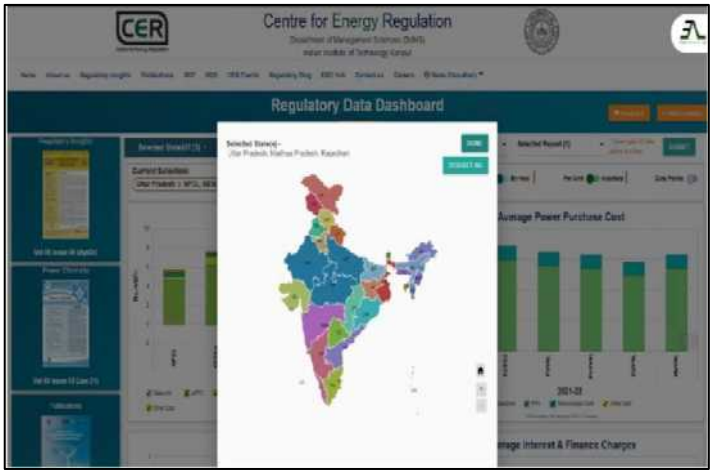
- The program content is delivered through recorded, live and live interactive sessions through online mode.
- The live/ interactive sessions are scheduled in the evenings and over the weekends.
- More than 25 hours of content is delivered over 2-3 weeks.
- Performance during online exam, attendance, and interactions during live sessions form criteria for award of **Certificate of Achievement** or **Certificate of Participation.**
- For more information please visit - https://cer.iitk.ac.in/olet/rcp



The programs, delivered in online mode, are designed for working professionals as well as researchers and students. The programs are suitable for officials of Regulatory Commissions, Government, Public and Private sector including Generation Companies (Thermal, Hydro and RE), Licensees (Transmission, Distribution and Trading), System Operators, Open Access Consumers, Equipment Manufacturers, Infrastructure Companies, Banks & Financial Institutions, Insurance, Pension & Investment Funds, Consultants, Academicians and stakeholders working across energy/ power sector supply chain including Green Hydrogen, Storage, EV, Coal, Oil & Gas, etc.

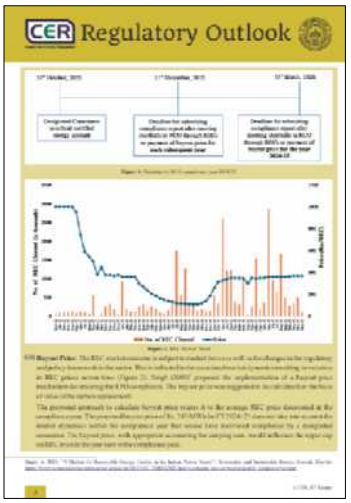
Regulatory Knowledgebase:

Regulatory Data Dashboard – In-house developed tool: CER's Regulatory Data Dashboard is designed to leverage various data's (ACoS, ARR, etc.) to provide a visualized snapshot of the techno-commercial aspects associated with the regulated business across generation, transmission, and distribution segments in India.



Regulatory Insights:

CER's *Regulatory Insights* (ISSN: 2583-2182 (O)), the anchor quarterly periodical, showcases its regulatory and policy insights, findings of regulatory research, and snapshots of key regulatory and policy developments across the Indian power sector. *Regulatory Insights* reaches more than 5,000 decision makers, regulators, policymakers, sector leaders, investors, as well as the larger research community at the national and international level.



Scan QR code to read Regulatory Insights

For any collaboration enquiry, write to anoops@iitk.ac.in.

Energy Analytics Lab (EAL)

The Energy Analytics Lab (EAL), supported by CSR funding from the Indian Energy Exchange Ltd., is an industry supported academic initiative of the Department of Management Sciences (DoMS), IIT Kanpur. The EAL aims at building power market database, and developing learning and visualization tools for the same.

Key Objectives

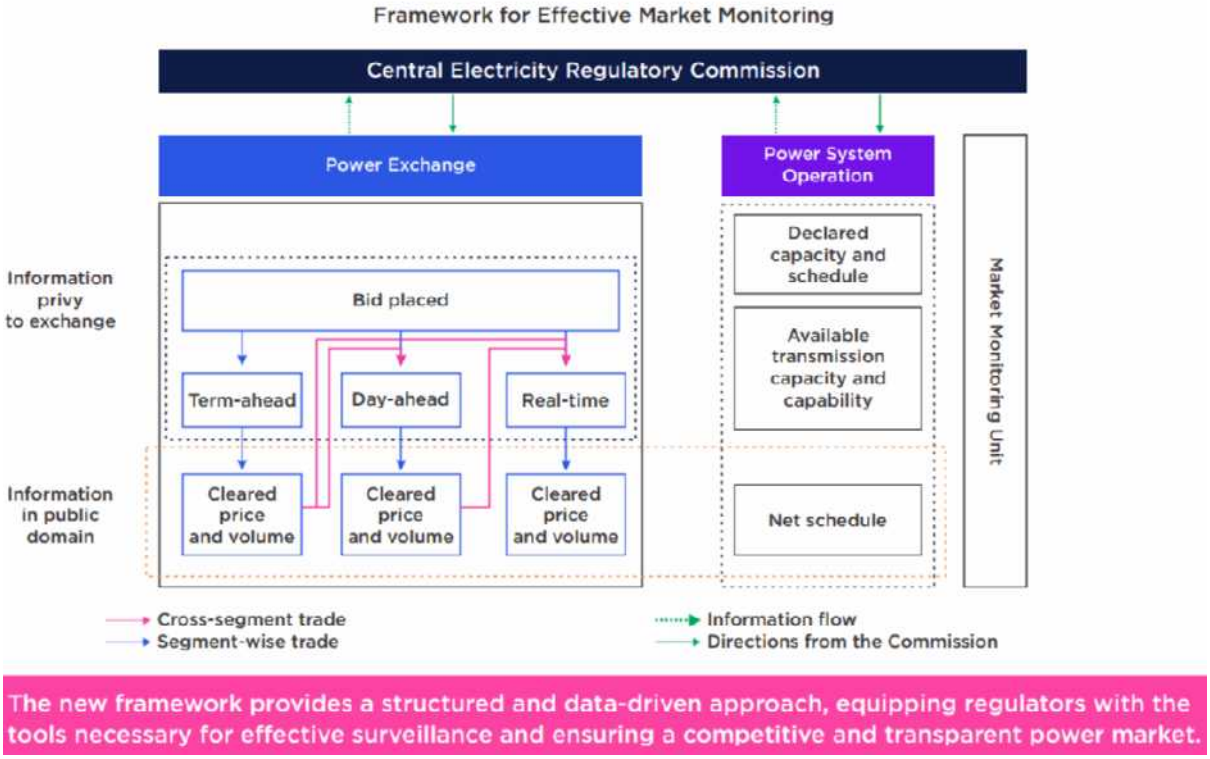
The main objectives of the Energy Analytics Lab (EAL) include the following:

- Develop learning and visualization tools for the power market and power system modeling.
- Quality data analysis and modelling for decision making.
- Provide research-based inputs to policy makers, regulators and sector stakeholders.

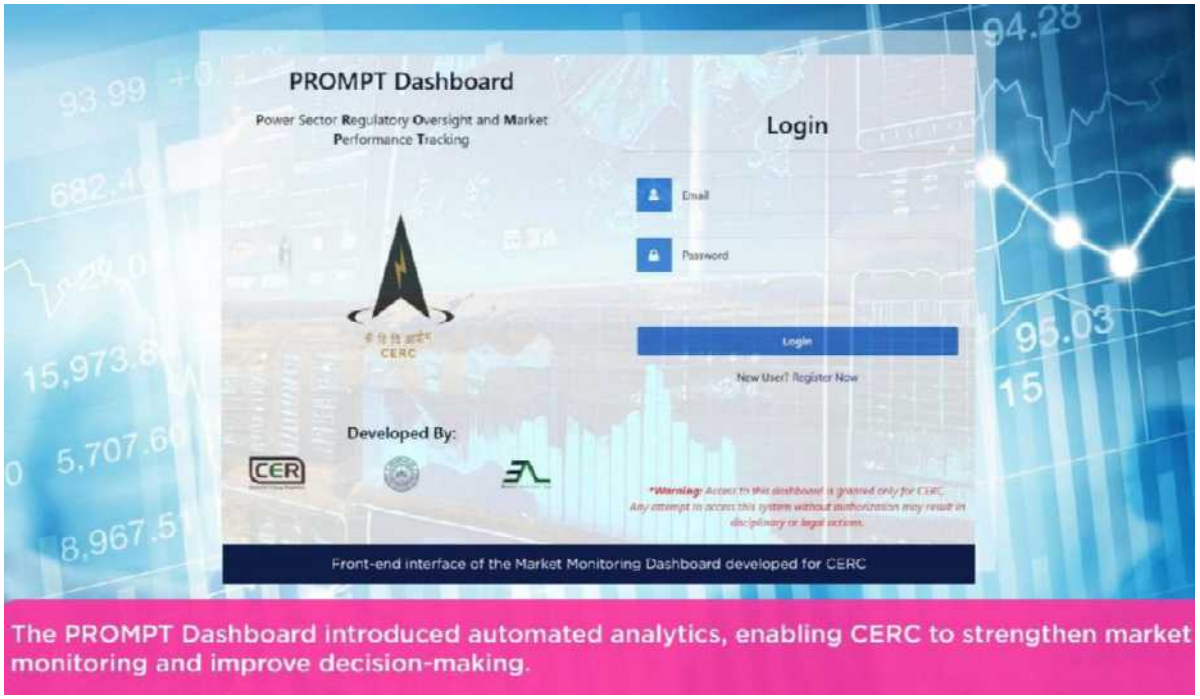
EAL, IIT Kanpur: A Leading Research Lab on Energy Data Analytics and Modelling

Recent Projects and Achievements

- **Long-term demand forecasting and Power Procurement Planning & Resource Adequacy**: EAL successfully completed studies for ***Uttar Pradesh, Chhattisgarh, and Rajasthan*** in collaboration with Uttar Pradesh Power Corporation Ltd., UP Electricity Regulatory Commission, Chhattisgarh State Electricity Regulatory Commission.
- **Resource Adequacy Framework for Distribution Utilities: Methodological and Implementation Issues:** EAL proposes a Resource Adequacy framework for Indian DISCOMs to maintain reliability with rising renewable penetration. It strengthens demand and peak forecasting, uses metrics like Planning Reserve Margin, and assesses capacity credits and captive generation impacts on procurement.
- **Renewable Energy Integration:** A comprehensive "RE Integration Study for Gujarat State in 2030" was conducted by EAL. We also exploring modelling, flexibility analysis, and storage options for a more robust renewable energy integration.
- **Market Monitoring Framework for the Indian Power Sector for CERC:** A robust market monitoring framework is vital to ensure fair competition, curb manipulation, and improve transparency in India's power sector. Existing surveillance needs more sophisticated data and analytics for effective oversight. Key outcomes include a comprehensive market competitiveness framework, more granular market analysis, and guidance toward unified monitoring.



- **Power Sector Regulatory Oversight and Market Performance Tracking (PROMPT) Dashboard for CERC:** Effective regulatory oversight and analytics driven monitoring strengthen competitive, transparent electricity markets, deter manipulation, and deliver advanced monitoring tools, automated reporting, and secure, scalable platforms for dynamic market surveillance capabilities. We also built in-house models to provide valuable insights for power system planning and procurement.



The PROMPT Dashboard introduced automated analytics, enabling CERC to strengthen market monitoring and improve decision-making.

MoUs with Sector's Leading Entities

Central Electricity Authority

National Thermal Power Corporation

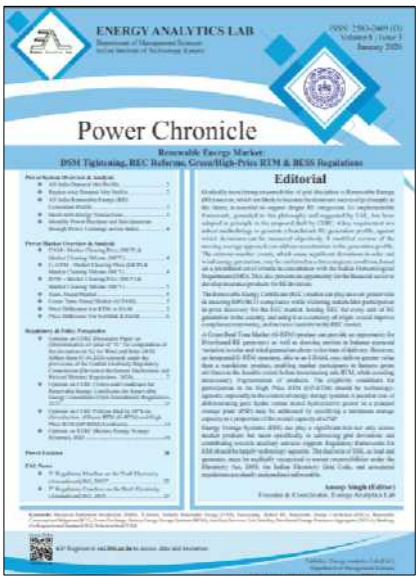
Central Electricity Regulatory Commission

Solar Energy Corporation of India Limited

Grid-India Corporation of India Limite

Power Chronicle

EAL's Power Chronicle (ISSN: 2583-2409 (O)), brings insights into key aspects of Power Market, System Operation, Policy, and Regulatory developments in the power sector, accompanied with an analysis based on operational data. This would assist policymakers and regulators in taking appropriate initiatives to develop the Indian power market, create a conducive environment for investment, and meet the green growth aspirations for the sector.



EAL at IIT Kanpur is committed to driving innovation and excellence in the energy sector.

Through insightful research and analysis, EAL empowers informed decision-making and the development of sustainable energy solutions

Scan QR code to Register at eal.iitk.ac.in to access data and resources

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