



Virtual Stakeholder Consultation

10th May 2022

Elements of Electrification Strategy for India

The EU - India Clean Energy and Climate Partnership (CECP)

Background

Under the EU-India Clean Energy and Climate Partnership (CECP) (www.cecp-eu.in), a document titled ‘Elements of Electrification strategy for India’ has been developed. The document explores the potential and elements for a possible strategy to drive deep electrification in India. The status of electrification in the main sectors including industry, residential, transportation and services and their sub-sectors, opportunities to increase electrification and possible strategies to drive this transition are studied. The report looks at the European strategies and initiatives to increase electrification, best practices in technology and policy framework and assesses their relevance in the Indian context. Based on the findings and learnings from Europe, the report provides several sectoral and sub-sectoral recommendations, primarily to increase electrification and to explore alternatives for decarbonization.

The virtual stakeholder consultation/workshop was conducted on 10th May, 2022. The event was attended by more than 30 participants, including representatives from BEE, policymakers, SDAs, NITI Aayog and European experts.

Inaugural session

- Mr Rajeev Ralhan, Counsellor, Executive Director, PwC, extended a warm welcome to all participants and provided a brief introduction of the EU-India CECP and shared his views on the following:
 - Discussions and deliberations about the topic of the stakeholder consultation meeting titled “Elements of Electrification Strategy for India”.
 - Discussion about moving towards Green Energy transition in India under EU-CECP.
 - Assessment of key findings and seeking inputs from key ministries, associations and stakeholders
- Mr. Edwin Koekkoek, First Counsellor, Energy and Climate Action, EU Delegation to India shared his views on the following:
 - Discussions about the report and knowledge sharing about electrification of the economy in Europe and seeking inputs for possible strategies in India
 - Discussion about the partnership and co-operation under the EU-CECP with the Ministry of Power, BEE, MNRE, the Ministry of Petroleum and Natural Gas which was approved with the President of the European Council and the PM of India.
 - EU Green deal and the Greening of the economy in the Power, Transport, Buildings, Agriculture and Heavy Industry sectors
 - Reducing emissions to 55% and becoming Climate Neutral in 2050
 - Deliberations about a Just Transition for sectors that will not benefit from the Green Energy transition to create opportunities for them
 - Electrification of the economy would be guided from the Energy Efficiency First principle and to produce electricity from renewable energy sources (solar, wind) and to look at Hydrogen and Biofuels solutions

Session: Elements of Electrification Strategy for India

Speakers	Topic
Shri Abhay Bakre, Director General, BEE	Opening remarks and setting the direction
Mr Edwin Koekkoek, First Counsellor, Energy and Climate	Welcome remarks and introduction to the European Green Deal

Action, EU Delegation to India	
Mr Niels Bahnsen, Project Director, NIRAS	Background on electrification of the European economy
CECP Team (Rajeev Ralhan & Niels Bahnsen)	Possible elements of an Electrification strategy for India - presentation on the draft report
Stakeholders will be invited to give 3 minutes reactions to the draft report	Stakeholder consultation
Mr Rajeev Ralhan, Executive Director, PwC	Concluding remarks and vote of thanks

Shri Abhay Bakre, Director General, BEE –

- The total supply of energy is about 188 million of Oil equivalent (Coal, Oil and Gas, Renewables) as compared to the total demand is 560 million of Oil equivalent, representing a 80% share of direct consumption of fossil fuels compared to 20% of electricity
- The aim is to convert the consumer end or end-use into electricity as it has distinct advantages of being easy to manage and measure, easier to save energy, it being a cleaner option at the consumption end, easier to infuse renewable option from the generation side and lesser cost of electricity
- Energy efficiency is a key area in the Electrification strategy
- Sectors such as Residential, Commercial have a high electrification share but other sectors such as Industrial and Transportation have a high non-electric share
- Strategy to increase electrification share in Transportation sector includes elements such as e-mobility, EV infrastructure, scaling up infrastructure for e-charging, bringing in more technologies, business models such as battery swapping, heavy loads like buses, and promotional schemes such as PLI
- In the Large Industries sector, the use of thermal-based energy sources are high and hence the share of non-electric sources is high
- Need to adopt technologies where the use of fossil fuel is low through gradually increasing the share of electricity in sectors, sub-sectors and technology areas
- The report will help facilitate policymakers to formulate better strategies for using round the clock renewables, decentralized renewables, captive renewables, storage options and consumption options
- Incentives to drive renewables such as Transmission costs, Green Energy corridor, offshore winds, carbon capture will multiply when electrification will be a key element in the energy transition strategy

Shri Rajeev Ralhan and Mr. Niels Bahnsen, CECP Team, delivered their presentation on ‘Elements of Electrification Strategy for India’ –

- There are 3 sets of strategies for looking at the electrification agenda to move towards green energy transition:
 - Requirement of demand side to be electrified to absorb the increasing share of renewable energy on the supply side
 - It is understood that feasibility of total electrification of processes may be limited in some sectors or sub-sectors. In such cases, other clean energy sources such as Green hydrogen could be explored to transition away from fossil fuels
 - Taking learnings from the EU as to how to increase electrification in sectors such as industrial, residential, transportation and services by tapping into European experience and expertise
- The EU-Green deal – To be climate neutral by 2050 depends on a 3-tier strategy:

- Level 1: ‘Energy Efficiency first’ is the core of the strategy
- Level 2: A more circular economy, sector decoupling and electrification
- Level 3: Promote renewables and low-carbon fuels, including hydrogen for hard-to-decarbonise sectors
- Hydrogen is an important element of the EU strategy on energy system integration
- In terms of sectoral status of electrification in the Industrial sector, the penetration of electricity is different in India and the EU, as the per-capita consumption of electricity in the EU is 6 times that of India at present
- In India, the electrification in the Industrial sector was limited to 16% in 2017-18, as compared to 38% in the EU in 2019
- The important elements in the EU policy approach towards the Industrial sector includes the following:
 - The EU Emission Trading Scheme (ETS), a “cap and trade” mechanism has shown to be a valuable tool for reducing CO₂-emissions
 - The larger energy consumers will be met with increasingly stricter ETS quotas, which will be adjusted to meet the EU’s neutrality target by 2050
 - EU Commission focuses on initiatives known as alliances across large companies, SMEs, service providers, public authorities and academia, which get support and funding by the EU. Example- Alliances under batteries, plastics and microelectronics
 - Building on the successful template of industrial alliances, a new European Clean Hydrogen Alliance will be launched, and an alliances on Low Carbon Industries will follow
- The technologies which are relevant can be the following:
 - Direct reduction of iron substituting coal with green hydrogen and electrolyzers
 - Direct use of renewables for industrial heating, especially where the required temperatures are less than 200°C
 - Utilization of waste heat for district heating and cooling is also being explored
 - Heat pumps are used in industrial plants where simultaneous heating and cooling is used. Example – in dairy plants
 - High temperature heat pumps are maturing and are now commercially available e.g. boiling processes
 - Green hydrogen for use in chemical plants or refineries and also as a means for electrification
- In terms of sectoral status of electrification in the Residential sector, the electrification rate in this sector was limited to 14% in India in 2017-18 as compared with 27% penetration rate in the EU in 2019
- The EU approach towards the residential sector includes the following policy approaches:
 - Energy Performance of Buildings Directive 2010/31/EU (EPBD)
 - Energy Efficiency Directive 2012/27/EU
 - ‘Renovation Wave’ Initiative and Strategy on the built environment as part of Green New Deal.
 - Sector coupling, e.g. use of waste heat from industry
- The technologies relevant in the residential sector can be the following:
 - **Space heating** – mostly dominated by fossil fuel-heated boilers. However, electric heating, heat pumps and efficient district systems are being explored which would be eventually fueled by renewable energy.
 - **Space cooling** – Efficient district cooling system and waste heat based VAM
 - **Buildings** – Smart buildings with smart devices and appliances
 - **Residential cooking** –
 - For cooking less than 50% is on electrical stoves with natural gas, city gas or LPG as the main other sources.

- In many areas it is cheaper to heat by gas stoves than electricity.
- The number of gas-based ovens are decreasing in the EU, e.g. in Spain the share of households with gas ovens have decreased from 36% in 2010 to 23% in 2017
- For the sectoral status of electrification in the Transportation sector, the electrification rate in India was limited to 1% in 2017-18, as compared with 2% penetration rate in the EU in 2019
- The EU approach towards the transportation sector includes the following components:
 - Green electricity from renewables is being explored as a key strategy
 - Emphasis on expanding public charging infrastructure, expansion of battery production, strengthening electricity infrastructure, integration of renewable energy and promotion of technical advancements to the consumers
 - Since 2014 the EU directive (2014/94/EU) sets the requirement for deployment of EV charging infrastructure in the EU, and one target was to ensure that one EV charger was in place for every 10 EVs in urban areas
 - A new initiative is in process that aims to greatly expand the EU's network of recharging and refueling stations for alternative vehicle fuels- mainly batteries, natural gas and hydrogen and ensuring cross-border solutions in the EU
 - EU Green deal- At least 1 million public accessible recharging and refueling points for road vehicles in place by 2025
 - Hydrogen/Power-to-X solutions, where direct electricity propulsion is not directly possible such as in heavy road transport, ships and airplanes is being explored
- For the sectoral status of electrification in the Services and agriculture sector, in India, the Services sector has the maximum penetration of electricity (50%) in 2017-18 and Oil was the second most used energy source at 25%
- Similar to India, in the EU, the Services sector was the most electrified (53%) in 2019. Natural Gas was the second most used fuel at 32%
- The EU policy approach towards the Services and agriculture sector includes the following key components:
 - 2018 Energy Efficiency Directive
 - 'Renovation Wave' Initiative and strategy on the built environment
 - Nearly Zero Energy buildings brought under the ambit of EPBD
 - Smart Readiness Indicators for buildings
- The EU approach in the Services and agriculture sector in terms of technologies includes the following:
 - Sector coupling, e.g. use of waste heat from industry
 - Smart pumping from agriculture
 - Smart building technologies
- The elements of Electrification strategy for India in the Industrial sector has the following key interventions:
 - **Prioritizing energy efficiency in industrial processes**
 - Deep dive to identify energy intensive industrial processes and measures to make them energy efficient - a national energy efficiency repository with benchmarks
 - Assessing possibility of increasing stringency of allowances of the PAT scheme and creation of a carbon reduction programme - The EU ETS has been successful as a regulatory instrument in reducing the energy intensity of the European industry sector
 - Promote alliances across large companies, SMEs, Service providers - similar to Industrial alliances in the EU

- **Direct electrification of industrial processes, wherever possible**
 - Sectoral readiness assessments to identify potential for electrification in various industrial sectors
 - Promote R&D initiatives in electrification of industrial processes - R&D initiatives in the EU has led to successful deployment of heat pumps, direct heating using renewable and electro-fuels
 - Technology and knowledge transfer, and capacity building on new technologies viz. renewable energy-based heating, electrolysis
- **Renewable, Hydrogen-based and Power-to-X based industrial processes**
 - Identification of specific focus areas for green hydrogen applications through the recently announced National Hydrogen Energy Mission (NHEM)
 - Promote alliances across large companies, SMEs, Service providers for hydrogen and power-to-x. Example - New EU Clean Hydrogen Alliance; EU alliances on Low Carbon Industries, etc
- The elements of Electrification strategy for India in the Residential sector has the following key interventions:
- **Increasing energy efficiency of residential end-uses**
 - Increasing energy efficiency is the first step towards decarbonization of the residential sector (like EU Energy system integration)- Expanding the scope of S&L programme for other domestic appliances - A study could be carried out to identify and rank appliances for development of S&L programme
- **Promotion of electric cooking**
 - A market readiness assessment to understand user behavior, local manufacturing capacity, affordability, R&D needs, etc
 - Develop a roadmap for near and long term roll out of electric cooking across the country
 - Possible integration of the roll out plan with PM Kusum scheme, Atmanirbhar scheme and Skill India mission could also be explored
- **Promotion of energy efficient and low carbon cooling**
 - Development of an implementation roadmap for the India Cooling Action Plan (ICAP) - including possible innovative and competitive business models to increase uptake of low carbon cooling solutions such as cooling as a service
 - Harmonization of ENS with ICAP - development and implementation of harmonized guidelines catering to dual objectives of ENS and ICAP recommendations for different climate zones in India
- **Cross-sectoral integration of cooling and domestic appliances**
 - Assess cross-sectoral integration with circular economy approach – similar to the EU approach for district heating and cooling purposes
 - Assess the possibility of alliances with industries for Power-to-X collaboration to enable sector coupling and circular economy
 - Encourage development of smarter energy systems and smarter buildings to promote integrated systems

- The elements of Electrification strategy for India in the Transportation sector has the following key interventions:
- **Electrification of Indian railways**
 - Action plans towards implementation of Indian Railways target on electrification of routes on broad gauge planned by 2023 and goal of becoming “Green railway” (Net Zero Emissions) by 2030
- **Enhance electric vehicle penetration level**
 - Designing EV mandates specific to Indian manufacturing eco-system
 - Designing better incentives, financing schemes, business models for segments with higher TCO including polluting segments on passenger 4-wheelers, urban freight and HDVs
 - Linking of narratives on clean air, climate change, affordable transport and jobs with electric mobility and increasing outreach of current central and state level initiatives to promote EVs
 - Developing interoperability of charging stations
 - Developing innovative business models, incentives, and financing schemes
 - Policy support on registration of e-autos and transition from ICE-based autos to e-autos
 - Increasing focus towards electric buses and trucks through the lens of technological updates, demand generation and conducive policies
- **Hydrogen and electrofuel as replacement of fossil fuel**
 - Assessment of potential of electrification across all locations and hydrogen as an alternative under NHEM
 - Development of an electro fuel strategy defining the pathways from electrolysis to fuel for transport application (both road and rail transport)
- The elements of Electrification strategy for India has the following key components:
- **Prioritizing energy efficiency in the commercial and agriculture sector**
 - Expanding the scope of S&L programme for commercial appliances - A study could be carried out to identify and rank appliances for development of S&L programme
- **Promotion of energy efficient and low carbon cooling**
 - Development of an implementation roadmap for India Cooling Action Plan (ICAP) for commercial building sector - - including possible innovative and competitive business models to increase uptake of low carbon cooling solutions such as cooling as a service
 - Harmonization of ECBC 2017 with ICAP for development and implementation of harmonized guidelines catering to dual objectives of ECBC 2017 and ICAP recommendations for different climate zones in India
- **Increase smart electrification in agriculture sector**
 - Smart pumping controls for agricultural pumps. A market readiness study to identify local manufacturers including SMEs, startups; economics of scaling-up,
 - Develop smart pumping roadmap and integration possibility with Atam Nirbhar Bharat, Startup India and other initiatives, apart from PM KUSUM scheme
- **Cross-sectoral and energy management system integration of cooling and commercial appliances**
 - Pre-assessment on market readiness for smart building systems and controls for grid interactivity and integration with energy management system, user acceptance, availability of locally manufactured products, economics, etc
 - Need to develop strategy for Nearly Zero Energy development in the services sector
 - Possible integration with ongoing Smart Cities programme and other initiatives can be explored

- Need to assess the feasibility of alliances with industries for Power-to-X collaboration to enable sector coupling and circular economy - EU MS are working in this direction, particularly for data centers

- **Stakeholder comments on the draft report:**

Mr Edwin Koekkoek, First Counsellor, Energy and Climate Action, EU Delegation to India

- Identify main priorities and low-hanging fruits which can be done in the short-term and what areas will require more time and include those in the medium and long-term strategy
- Electrification is a main part of the Green energy transition for the EU, as electricity production has an effect on the air quality and GHG emissions

Mr. S Nand, ADG, FAI

- Unless the electricity generation is from green energy sources, there are many devices which are more efficient if primary fuel is used
- In regard to the fertilizer sector, there are hundreds of drives in the Ammonia and Urea plants for boiler feed water, pumps and fans and most of them are turbine-driven as there was not reliable source of electricity and turbine-drives were considered more efficient
- In the past 10 years, one of the energy conservation measures taken was those small drives have been replaced with motors, however for the large drives such as Carbon dioxide compressors, Air compressors and Syngas compressors, there is more efficiency to be achieved where energy efficiency is considered
- Captive power plants powered by GT is useful as there is co-generation of steam and the thermodynamic efficiency achieved is very high
- For the production of ammonia, refineries and city gas distribution, these areas have been identified for the utilization for the use of green hydrogen
- The first part of the policy regarding concessions have already been notified in terms of reducing the delivered cost of power
- Another focus area is how to reduce the cost of Hydrogen by reducing the cost of electrolyzers
- Policy should be regarding how to finance the viability gap funding for the use of hydrogen

Milind Deore, Director, BEE

- BEE has recently carried out a study for switching over of captive power plants from the large industrial sectors to the grid-based electrical power
- Based on the data collected, the industrial electricity consumption is indicated in the presentation is 16%, but the actual figure is 24%
- In the context of Indian demand situation, in particular in cooling sector, there is a need of concrete action plan and approach

Parmjeet Singh, Adl I A, Ministry of Steel

- The contribution of electricity in Iron and Steel sector is limited
- In case of primary sector, the Ministry is preparing roadmap to replace fossil fuels to greener options such as replacement of carbon, coke or thermal to Hydrogen

- Depending on the viable cost of greener options such as Hydrogen, the industry is ready to switch over to use the greener option

Vijay Kansal, PPSC

- The specific interventions to be looked at should be sector-based and industry-specific interventions such as segmenting rural and urban areas and devising interventions specific to different sectors

Closing Remarks by Mr. Edwin Koekkoek, Delegation of the European Union to India and Mr. Rajeev Ralhan, Executive Director, PwC

- The sector-specific and industry-specific interventions will be looked at and a concrete and viable implementable program will be developed based on the short, medium and long term horizons and incorporated in the draft report.
- The presentations, report and responses provided by all the stakeholders and participants form a valuable source of information and the inputs will be used in developing the draft report.

