

Summary of the Joint Research Project between NITI Aayog and Institute of Energy Economics Japan (IEEJ)

A statement of intent (SOI) was signed between NITI Aayog and IEEJ in December, 2015 wherein both the institutions agreed to analyze various issues related to energy sector of India and Japan. Consequently, NITI and IEEJ in mid-2016 undertook a joint project in which the following themes for research were identified:

1. Assessing the demand for natural gas/LNG for India and Japan till 2047
2. Analyzing the impact of increased penetration of renewables on grid for India and Japan till 2047
3. Analyzing the impact of clean coal technologies on the energy scenario of India and Japan till 2047

The teams at NITI and IEEJ took up the task to find answers to the above three research topics which have significant relevance for both the countries. Energy Security assumes importance as India imports ~40% of its primary energy requirement whereas Japan imports 92%. Moreover, India is abundantly endowed with coal, so it would like to utilize its coal reserves to address energy poverty in the country. Also, it is cheaper for Japan to import coal than LNG or crude oil. Therefore, it would be of interest to both the countries to see the implications of clean coal technologies on their energy scenarios in the wake of rising concerns of climate change across the globe. Further, India and Japan would like to analyze the impact of increased penetration of renewables on grid as both the countries are working to achieve their respective targets of 175 GW by 2022 and 80 GW by 2030. With the price of renewables, especially solar and wind declining by more than 60% and 52% respectively over the past 5 years, these technologies have the potential to address the energy security concerns for India and Japan in a sustainable manner and alleviate energy poverty, especially in India.

The team at NITI used various models in order to find out answers to the above research questions.

1. Apart from using India Energy Security Scenarios (IESS), 2047 for assessing the natural gas demand for India till 2047, World Energy Projection System (WEPS) model was also used to assess the natural gas demand for India and Japan. The Energy Policy Institute at the University of Chicago (EPIC) - India helped the team at NITI with the WEPS modeling to arrive at the results.
2. PLEXOS was used to get the hourly grid dispatch patterns and see the balancing capacity requirement that would be needed for India till 2047 if the electricity

generated from a certain installed capacity of renewables were injected into the grid. Lawrence Berkeley National Lab (LBNL) ran the PLEXOS model for the NITI team to arrive at the hourly grid dispatch patterns. However, IESS was used to arrive at the installed capacity of renewables till 2047.

3. IESS was used to analyze the implications of clean coal technologies in India till 2047, whereas Autoregressive Integrated Moving Average (ARIMA) model was used to carry out the same exercise for Japan till 2047. The University of Petroleum and Energy Studies (UPES) at Dehradun has provided critical inputs with regards to ARIMA modeling to arrive at the results for Japan.

The team at IEEJ used an Economy-Energy Model which is an econometric model based on the Keynesian economics theory for analyzing all the above three research topics.

There have been three rounds of discussion between NITI and IEEJ wherein the results for both the countries were discussed.

Finally, a one day conference was organized at NITI Aayog on 07.02.2017 to discuss the final results on the above three topics by IEEJ and NITI. The conference was chaired by Shri Anil Kumar Jain, Additional Secretary, NITI Aayog and was attended by Mr. Kenko SONE, Minister (Economic & Development), Embassy of Japan in India. Moreover, there was widespread participation from different think tanks and Government Departments such as Ministry of Power, NTPC, POSOCO, Shakti Sustainable Energy Foundation, GIZ, CEA, Ministry of Coal, CII, CSTEP, ISGF, Australian High Commission, CEEW, IRADe, PPAC, UPES and EPIC-India. The conference saw active participation of different institutions with lots of questions being asked from the teams of NITI and IEEJ.

This would follow with the final release of reports on the above three research topics by NITI and IEEJ in Mid March, 2017.