

# INDIA:

# TRANSFORMING TO A NET-ZERO EMISSIONS ENERGY SYSTEM

Scenarios *Sketch*



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## FOREWORD

Energy is at the heart of economic development and perhaps no country is more challenged by that association than India as it strives to create a better life for its population of almost 1.4 billion people. But how can India accomplish this and make progress towards reaching a net-zero emissions economy by 2050 in support of broader well-being?

In the 50 years since its creation, the Shell Scenarios team has sought to make a constructive contribution to public debate on a wide range of issues – including economic development and associated energy pathways. In India, The Energy and Resources Institute (TERI) and Shell have maintained a strong and active collaboration over the years to jointly examine these questions and explore a range of options for enhancing India's energy security and enabling energy transitions in a smooth and just manner. Most recently we have worked together to create this scenario sketch to explore the ongoing development of the Indian economy and the energy transition,

taking into consideration the government's goals of significant economic growth, universal electricity access and clean cooking for all. Each of these goals requires significant industrial capacity to achieve and, unless carefully managed, has the potential to increase greenhouse gas emissions. This sketch illustrates a technically possible, but highly challenging pathway to steering the domestic energy system towards net-zero emissions by 2050, while achieving India's economic development ambitions.

Today, greenhouse gas emissions have become central to any discussion on energy



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system choices and technological progress has brought to the fore an increasing number of fuel and technology alternatives that can be adopted at a commercial scale. Furthermore, the pressing need of eliminating dependence on fossil fuels is now recognised globally. There is an increased emphasis on innovative policies to avoid even greater dependency on fossil fuels in the future and ensure long-term sustainability.

Against this setting, it is an opportune time for India to re-evaluate its energy strategy and examine the choices, opportunities and risks across the energy sector. In this sketch, TERI and Shell have evaluated India's current options and limits across each of the energy sectors and sub-sectors and assessed the technology and policy options that can help the country accelerate towards the goal of net-zero emissions by 2050.

In this collaboration we have developed a **Net-Zero Emissions (NZE)** scenario<sup>1</sup>, the principle focus of this publication, to examine whether adequate opportunities exist to fully decarbonise the energy sector; we also highlight the areas where India's energy sector does not have enough choices for full decarbonisation by 2050. From a second

scenario, **Towards Net-Zero (TNZ)**, we highlight barriers to change that might emerge.

Energy efficiency, electrification and a switch towards decarbonised fuels are the three main pillars of India's energy strategy, with the need for a transformative move towards renewable electricity, hydrogen and bioenergy as key fuels. This analysis indicates that the industrial and heavy transport sectors are likely to face limits in achieving full decarbonisation, primarily due to technological constraints which leave residual emissions in the system. This necessitates the need for carbon removal options to achieve net-zero emissions, including both technical and natural solutions.

This report is a comprehensive assessment of a net-zero emissions strategy for India's energy system.<sup>2</sup> We offer it in the hope that the findings from this study encourage further deliberations on energy sub-sectors that could benefit policymakers and planners in charting India's sustainable energy transition.



The Energy and Resources Institute