RMI

with Galvanize Climate Solutions

Empowering India

The Clean Energy Growth Opportunity

Webinar

June 10 and 12, 2025

Agenda

12:00 ET Welcome and Introduction

12:05 ET Report: Empowering India

12:20 ET Moderated Panel with Q&A

13:00 ET End of Webinar

Speakers

Will Atkinson
Sr. Associate, Strategy Team

Meriah Jamieson
Sr. Manager, Communications

Panelists

Marshall Abramczyk
Principal, India Program

Ankit Kalanki
Principal, Cooling

David Livingston
Chief Strategy Officer,
Galvanize Climate Solutions

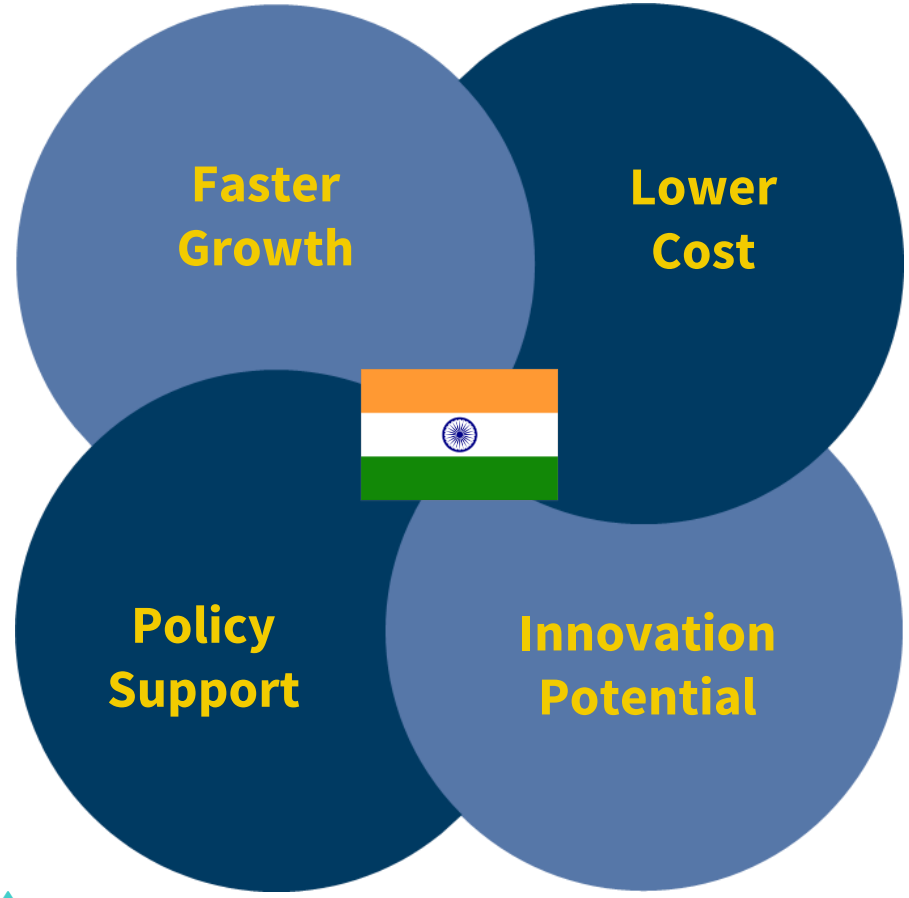
Sheldon Mendonca
Manager, Buildings

RMI

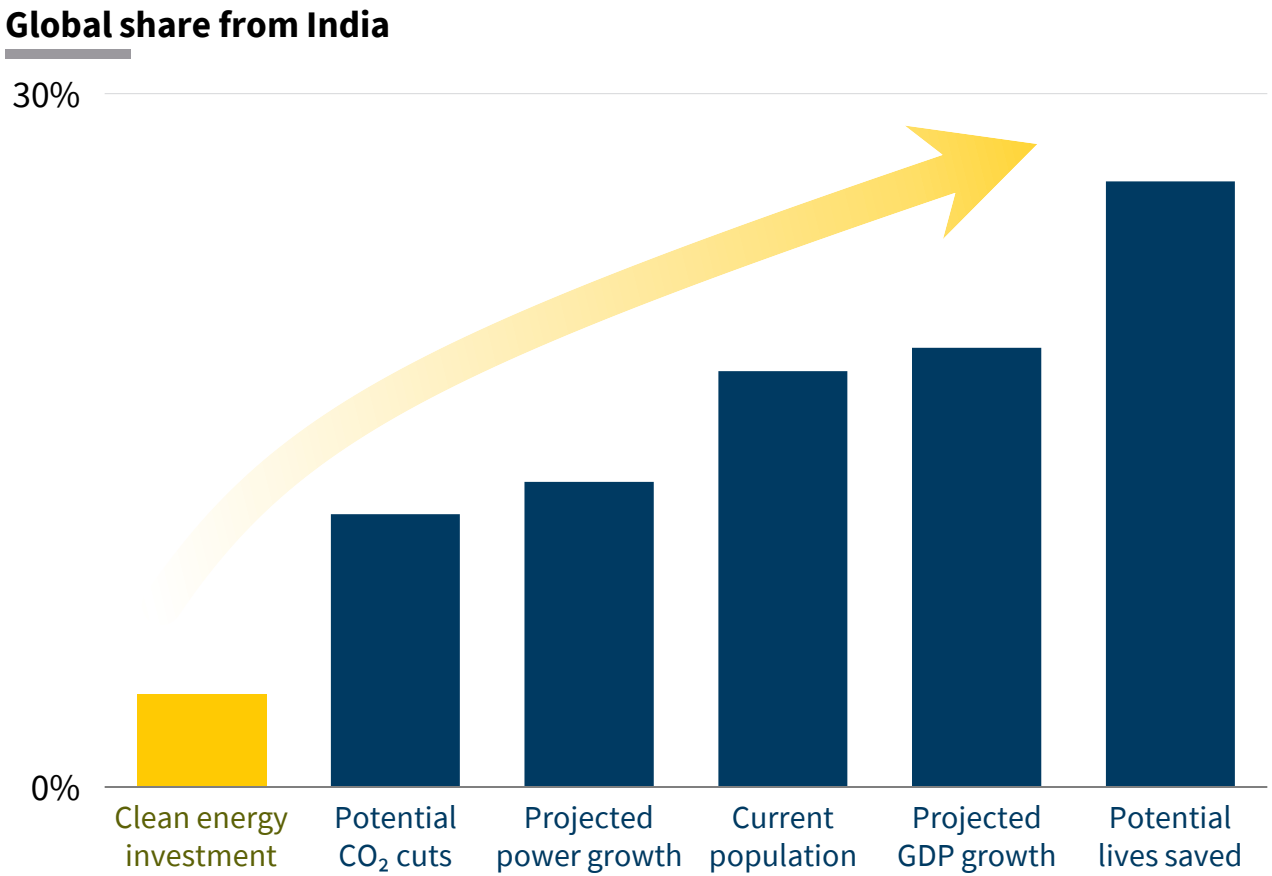
A different mindset for India

India can be a test ground for progress at scale, from lower-cost green hydrogen to innovative energy efficiency

India's unique strengths...



...are an untapped opportunity for investment and impact

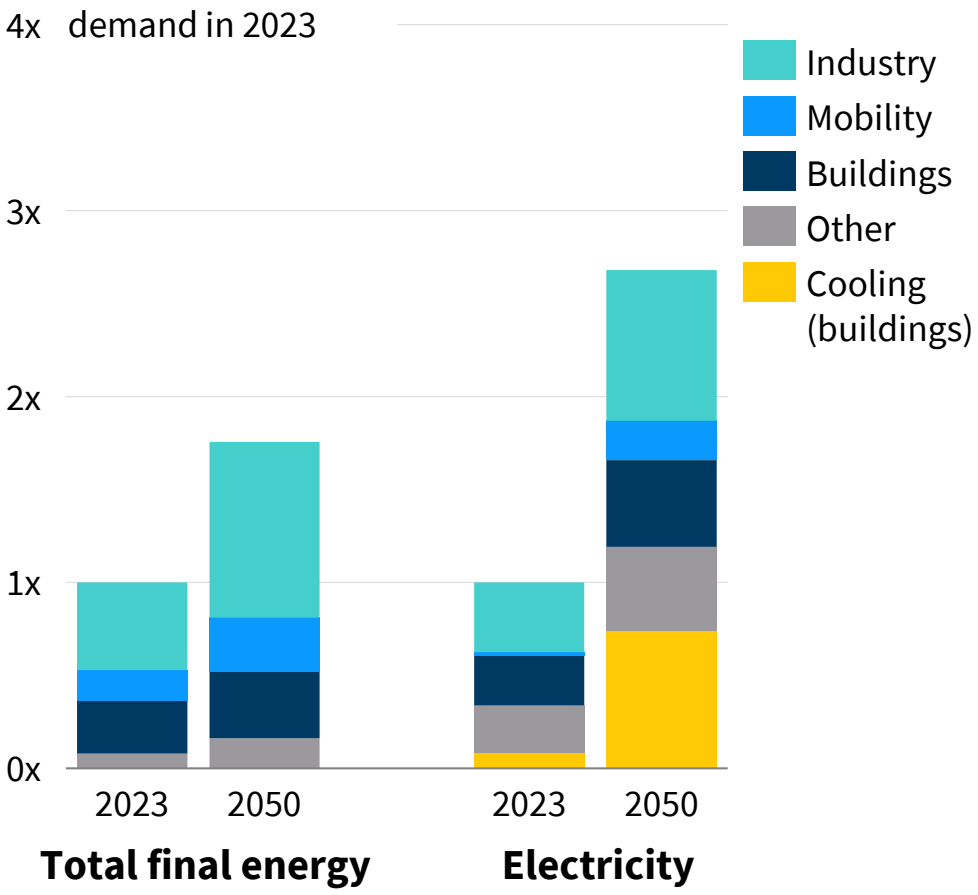


All sources are in the following slides.

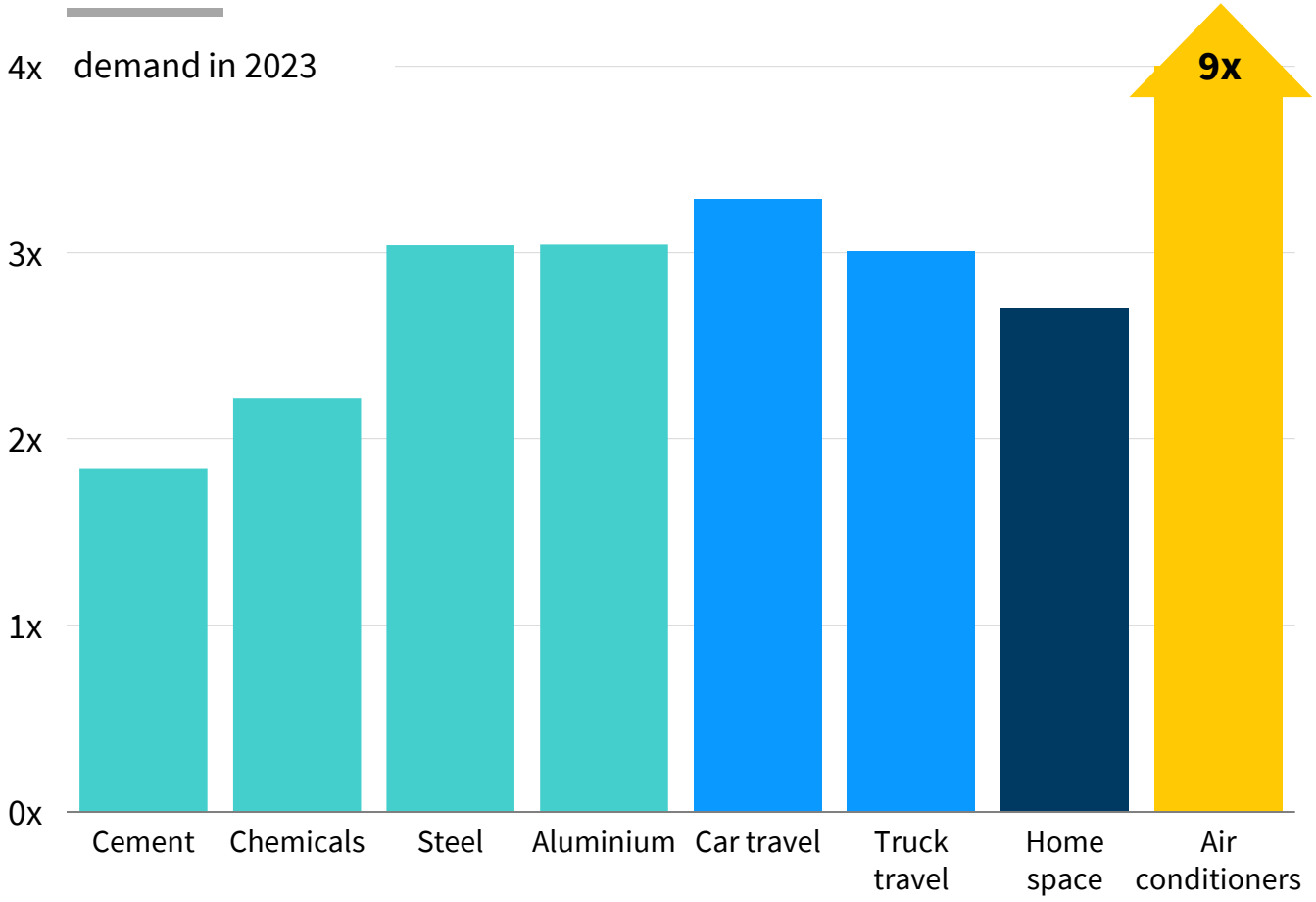
India’s energy demand sources are set to double, triple, or more

There will be rapid growth across sectors, led by the need for space cooling in a warming world

Growth in India’s energy demand…



…due to growth across sectors by 2050

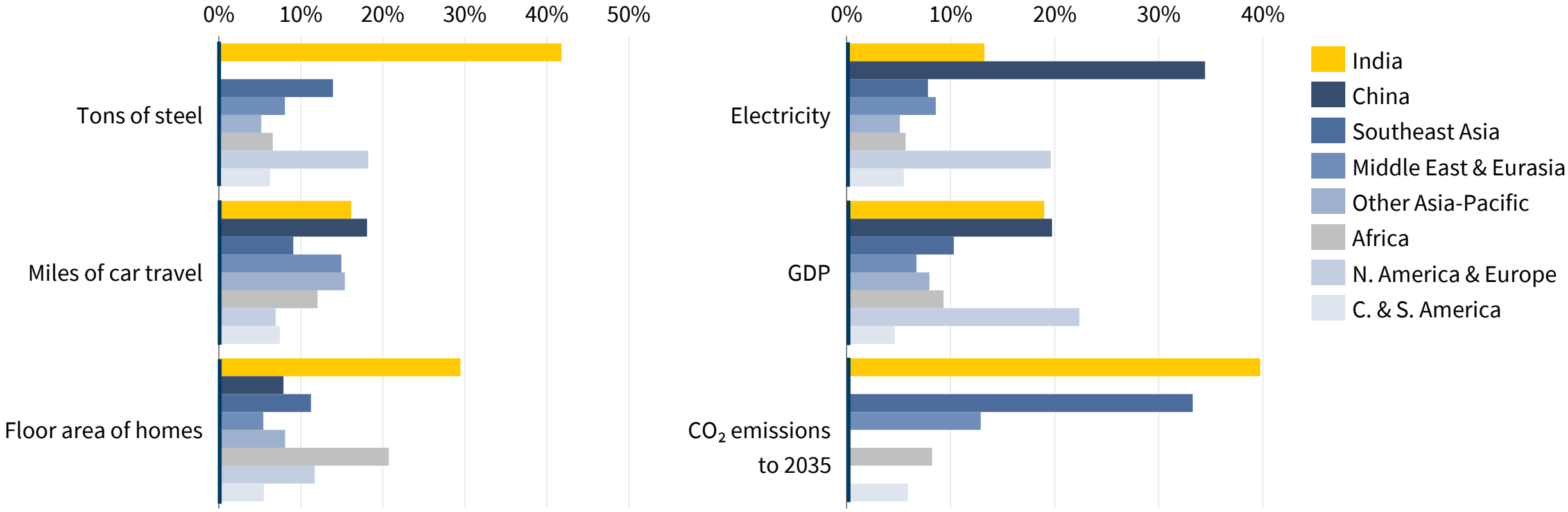


Source: IEA World Energy Outlook (2024 and 2023 for cooling), Stated Policies Scenario; RMI analysis

With the world's largest growth, India has an opportunity to build right the first time

From steel production to building space, India's potential for solutions is far above other regions

Fraction of projected global growth from 2023 to 2050



Note: "Other Asia-Pacific" includes other countries and territories in South Asia, East Asia, and Oceania.
Source: IEA World Energy Outlook (2024), Stated Policies Scenario

India's growth is at a different scale

Across clean energy, industry, and cities

Largest renewable energy project under construction

30 GW

India:

Khavda Renewable Energy Park

8 GW

US & Europe:

Dogger Bank

Largest green ammonia auction

729 kilotons per year

India:

Solar Energy Corp. of India

397 kilotons per year

US & Europe:

H2Global

Fastest-growing city

99 people per hour

India:

Delhi

10 people per hour

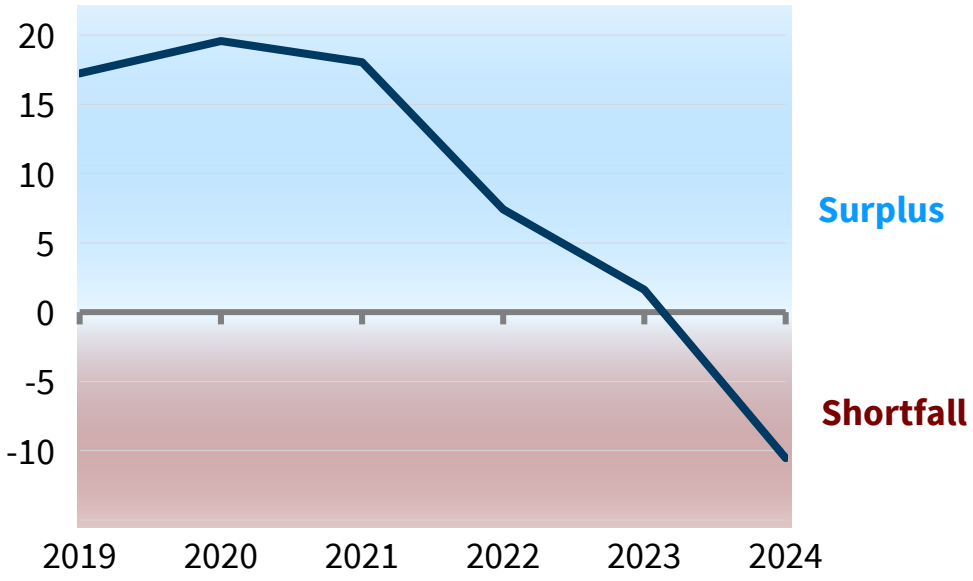
US & Europe:

Several

Source: Arasu (2024), Energy Digital (2025), BNEF (2025), World Population Review (2025), US Census Bureau (2024)

But barriers must be overcome to meet near-term demand growth

Margin of peak load forecast, GW



*India could see evening power shortages of **20–40 GW by 2027**, even with all planned thermal and hydro capacity built on time*

Key barriers

Local constraints from underestimated load growth, due to cooling demand and new loads including EVs

Insufficient storage and transmission, leading to stranded renewable energy that cannot reach the grid

Delayed power purchase agreements for renewables, due to slow processes and anticipation of lower tariffs

Fuel and generation shortages, including issues of coal supply, high-cost gas, and drought for hydropower

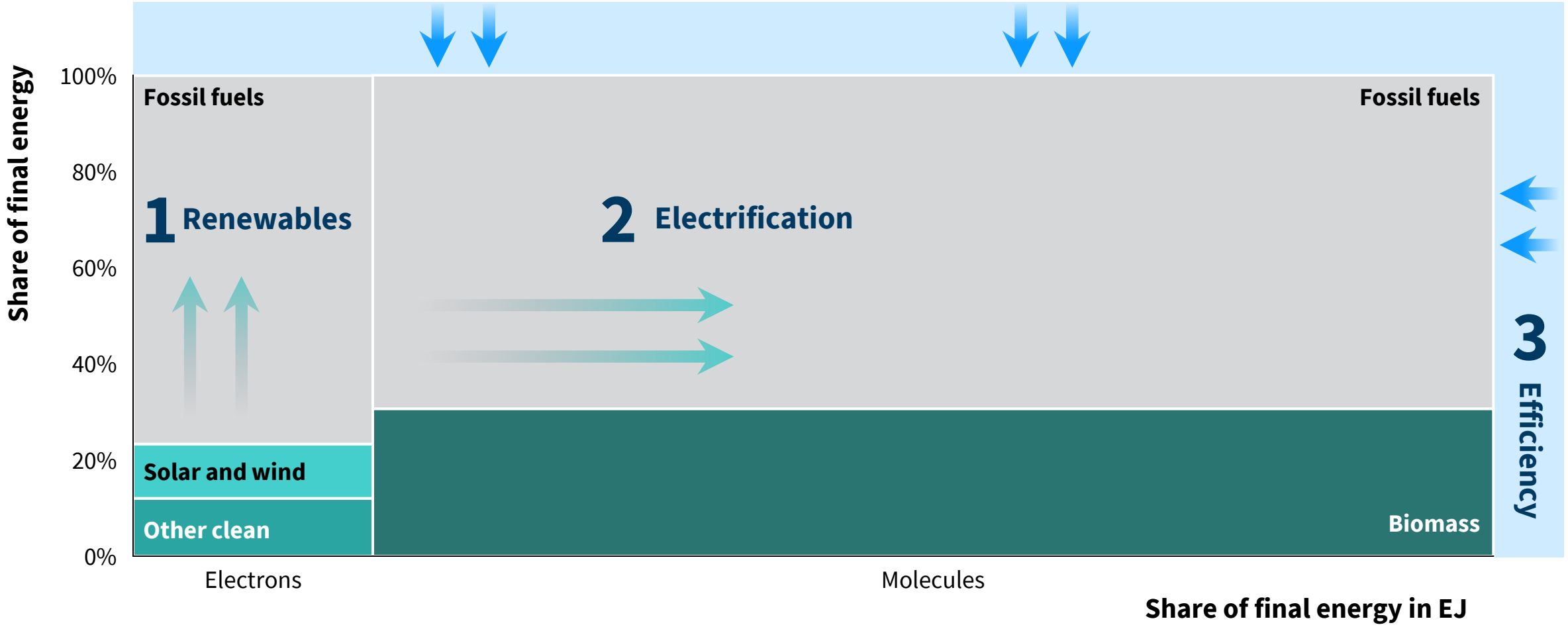
Utility finance challenges (despite improvement), particularly for local Discoms

Source: IEA Electricity (2025), India Energy & Climate Centre (2024), RMI analysis

Past progress has been led by three factors

Renewables, electrification, and efficiency are on track to rapidly transform the energy system

India's energy demand in 2023

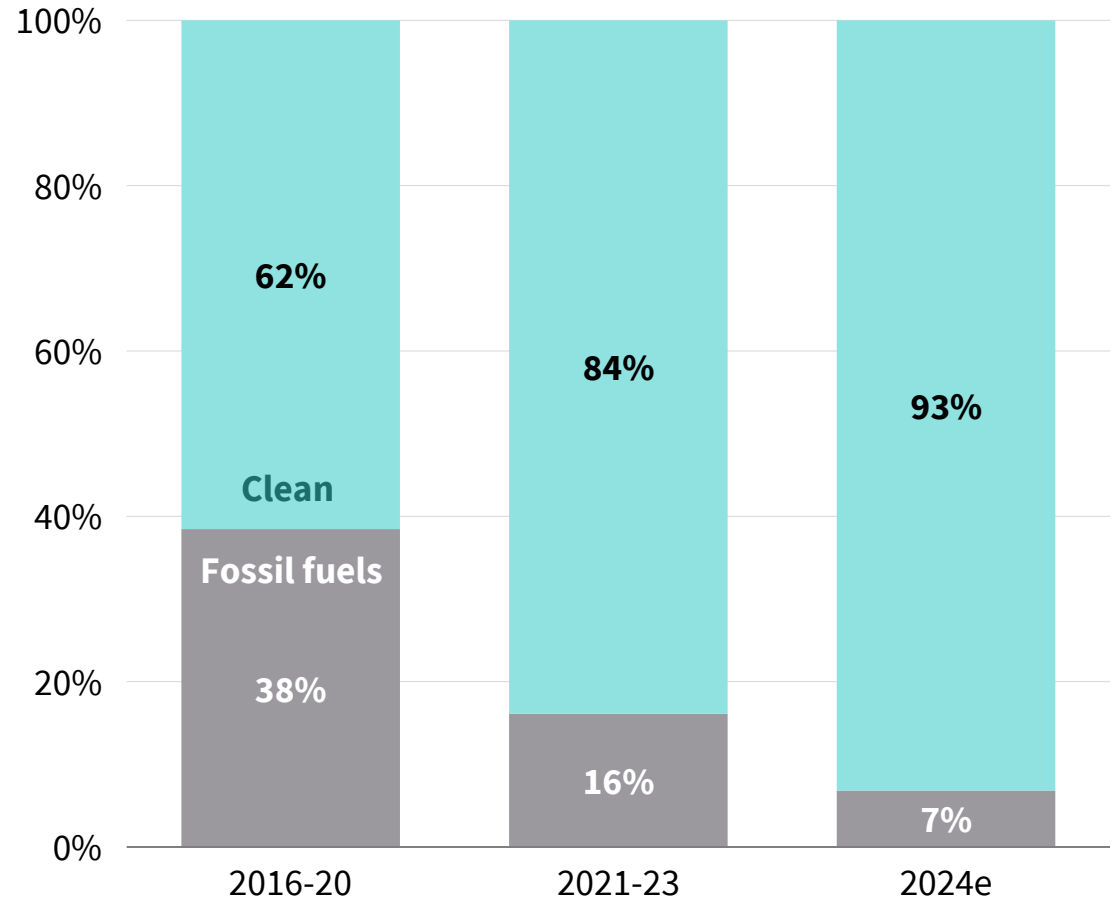


Source: IEA World Energy Outlook (2024), RMI framing

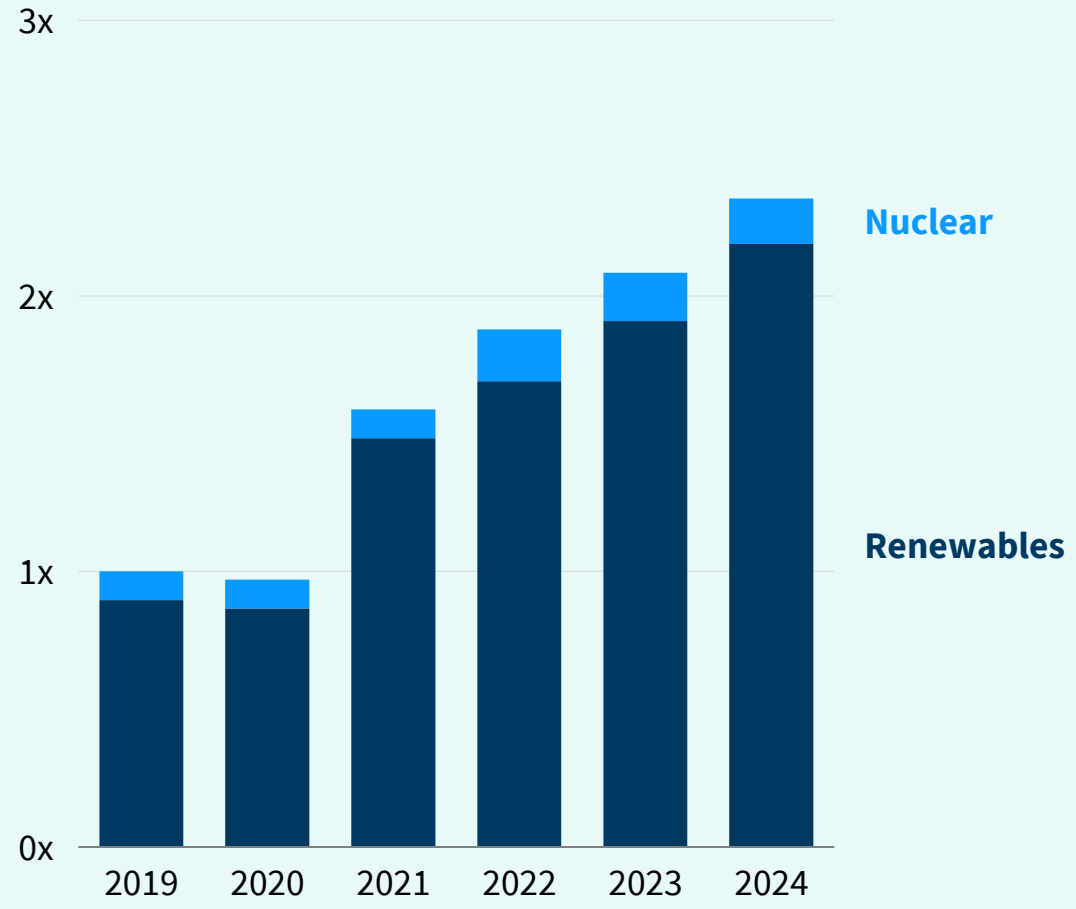
India’s electricity investment is growing and moving to clean sources

93% of capital is now in clean sources, with 2x as much investment as five years ago

Fraction of electricity capital



Total clean electricity capital, relative to 2019

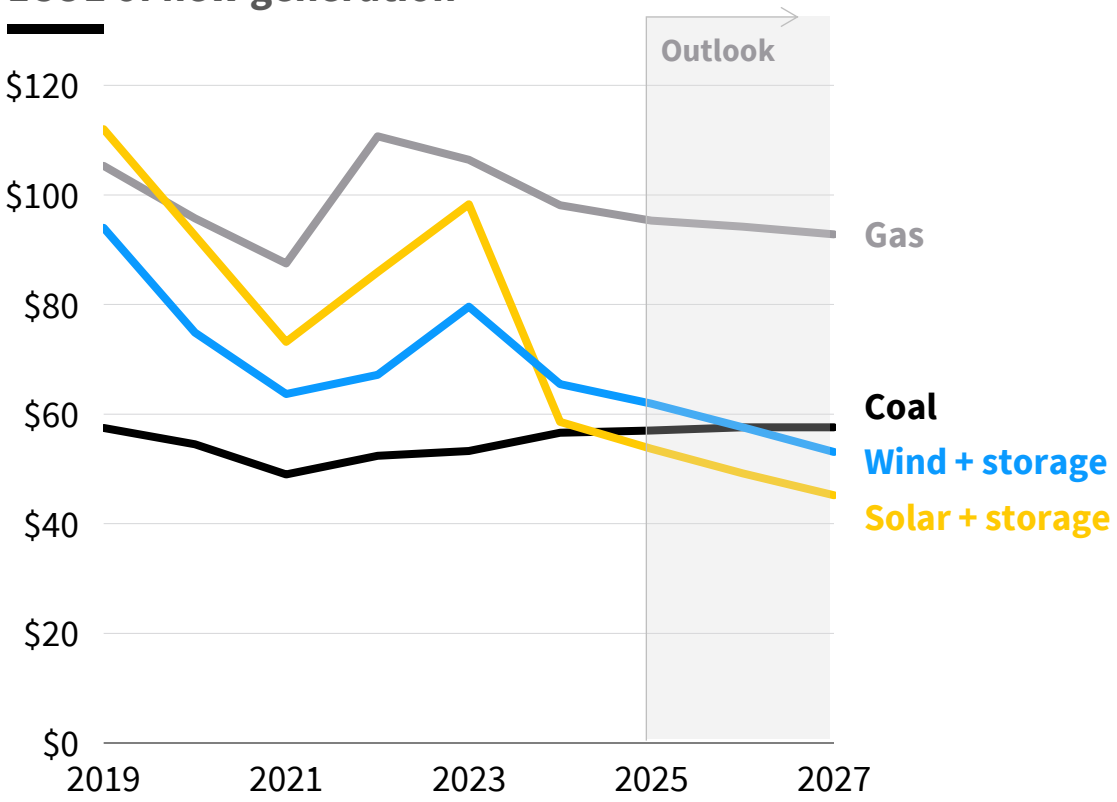


Source: IEA World Energy Investment (2024), BNEF Energy Transition Investment Trends (2025)

Clean portfolios are quickly becoming India's least-cost option

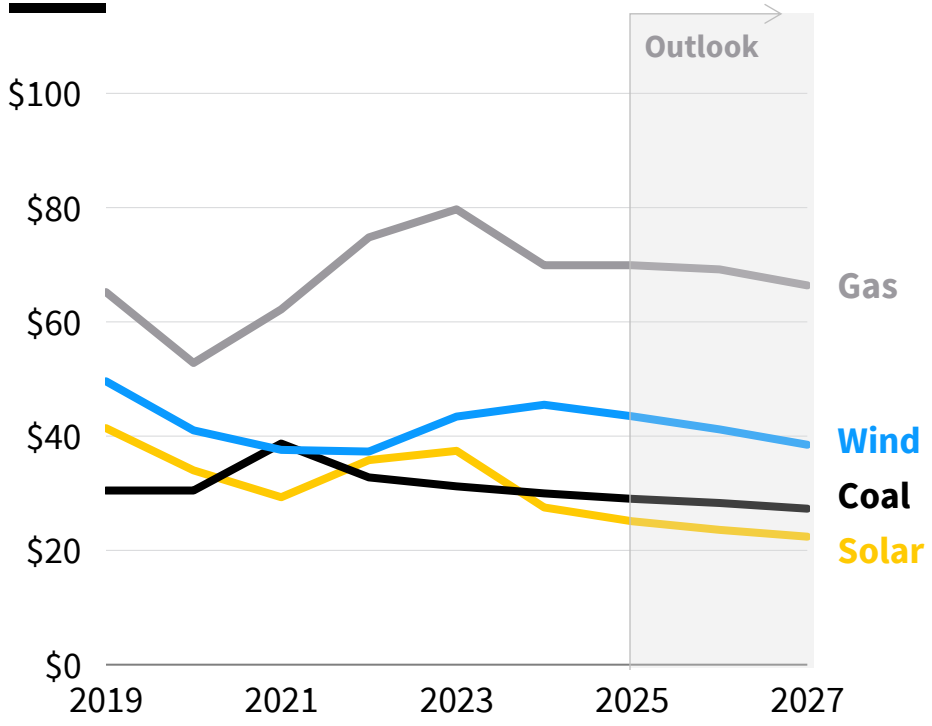
New solar + storage is cheaper than new coal

LCOE of new generation



New solar is cheaper than existing coal

LCOE of renewables vs. coal and gas short-run marginal cost



Note: Solar is fixed-axis, wind is onshore, gas is combined-cycle gas turbine, and mid-case storage assumes a 50% capacity ratio. LCOEs exclude subsidies and tax credits. More details can be found in the BNEF report methodology.

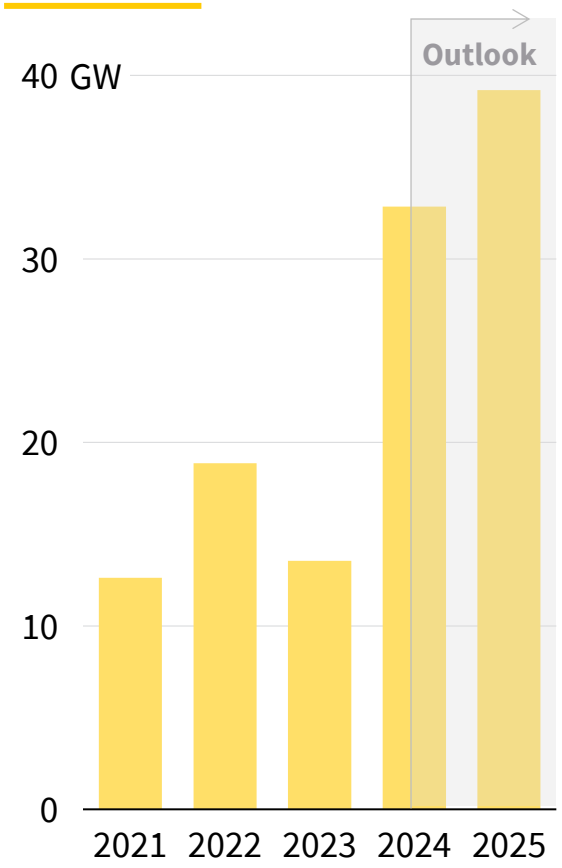
Source: BNEF Levelized Cost of Electricity (LCOE) Mid Case (2025), RMI analysis

Clean energy deployment rose higher than ever in 2024

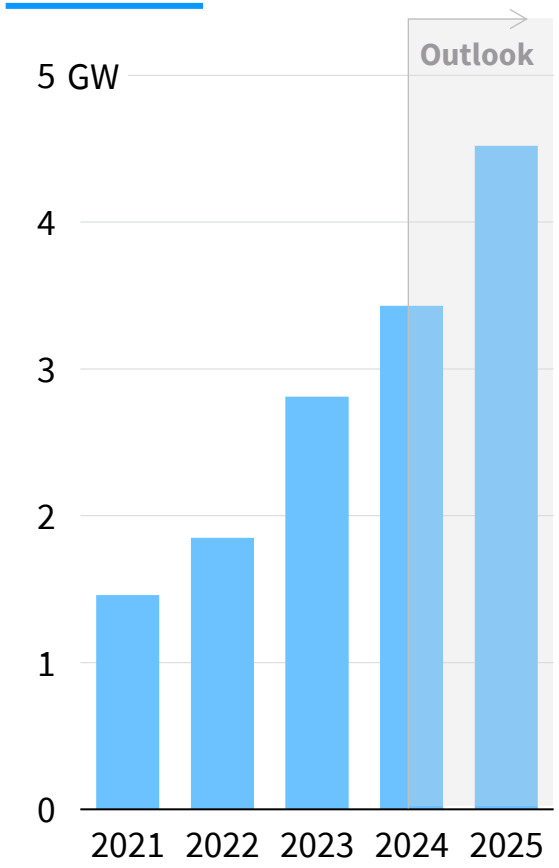
With further growth expected across solar, wind, and batteries

Annual capacity additions

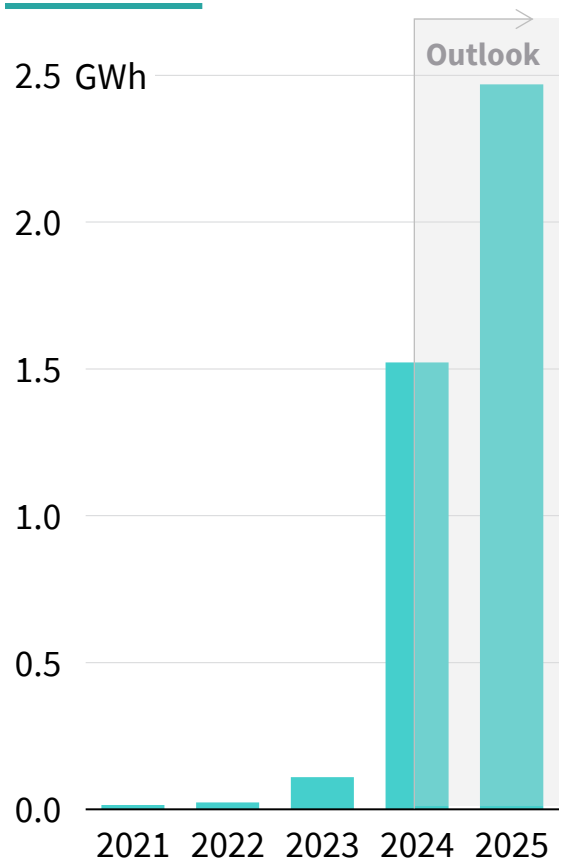
Solar



Wind



Battery grid storage

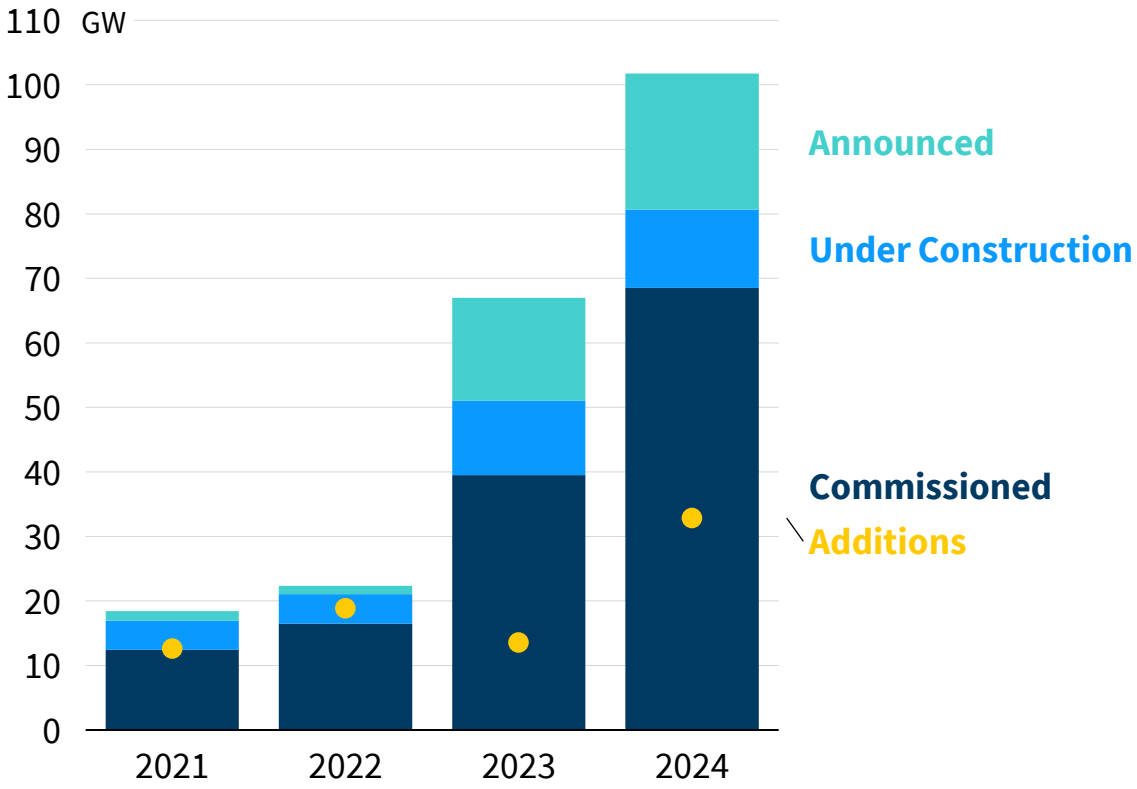


Source: BNEF Capacity Outlooks (2025), 1H Energy Storage Market Outlook (2025)

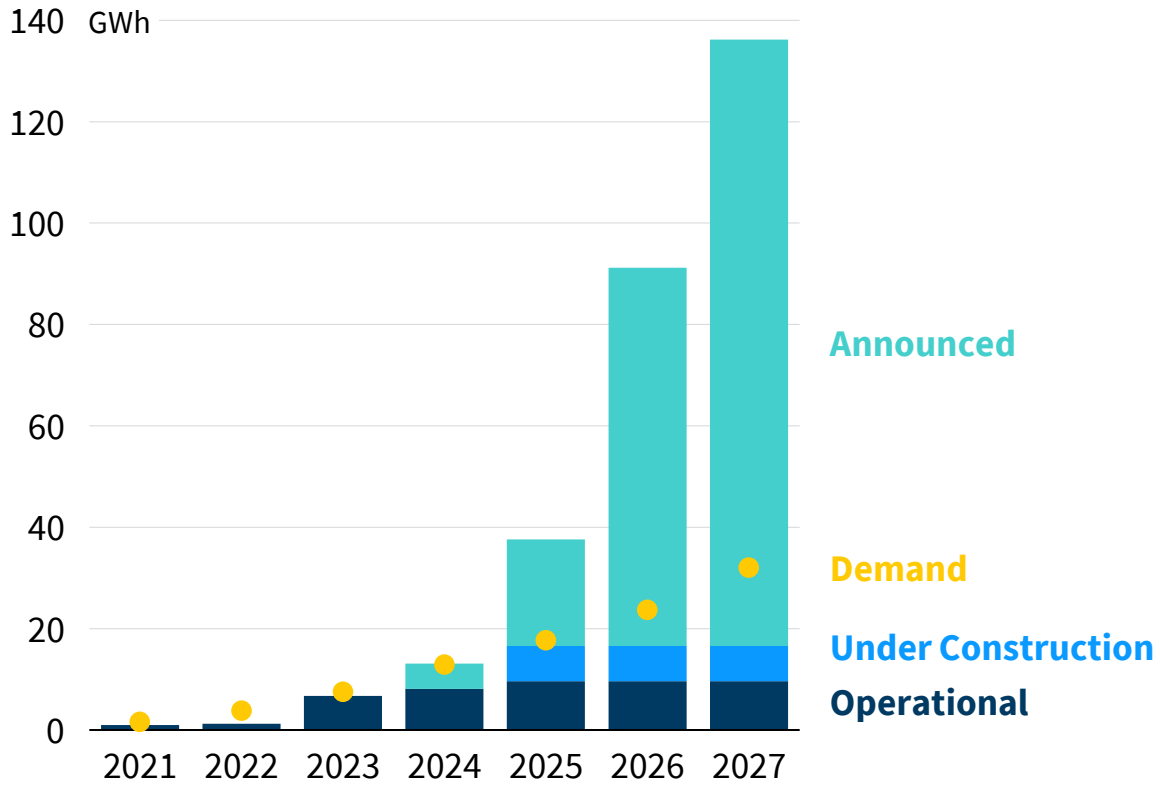
Cleantech manufacturing will help ensure India's progress

India is a net exporter of wind generators; incentives and investment are enabling the same for solar and batteries

Solar module manufacturing capacity vs. annual additions



Battery cell manufacturing capacity vs. annual demand

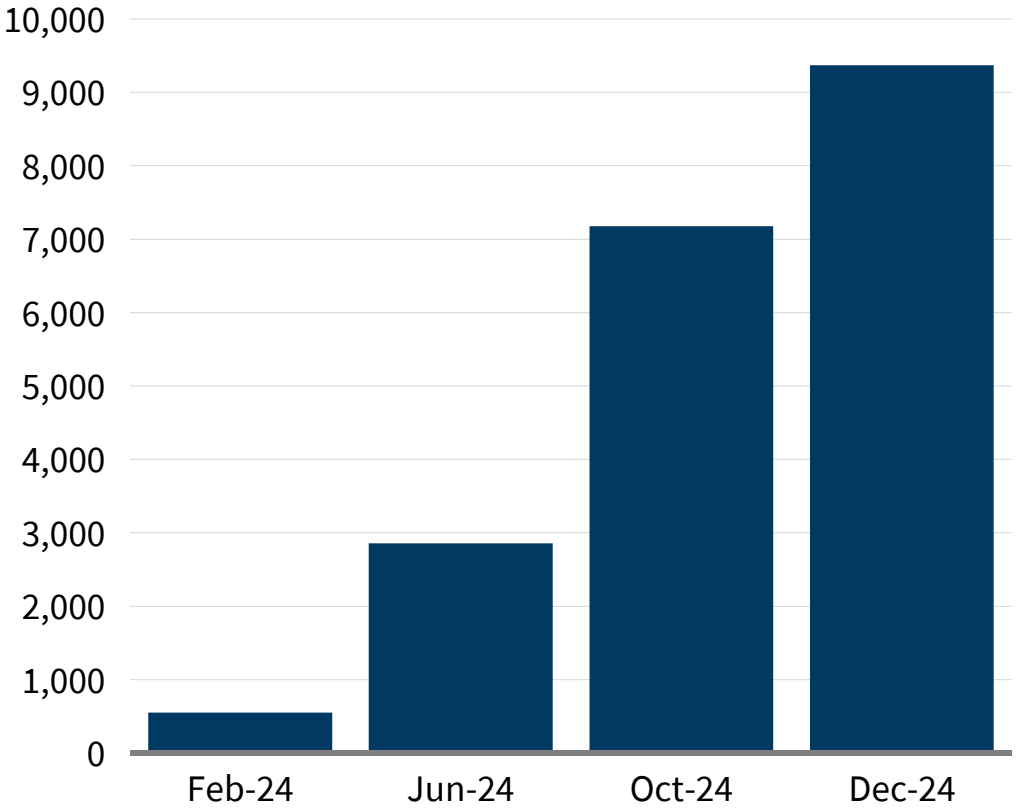


Note: 2024 solar additions and 2024–2027 battery demand values are estimated. For batteries, announced capacity is still much greater than projected demand, even for a net-zero scenario.
Source: CEEW (2024), BNEF Solar Forecasts (2025), Solar PV Equipment Manufacturers (2024), Battery Demand Outlook (2024), Battery Cell Manufacturers (2025)

Case study: rooftop solar in Varanasi

India has nearly doubled the total home rooftop capacity in 10 months, including 15x growth in Varanasi

Rooftop solar installations in Varanasi



Actions that contributed

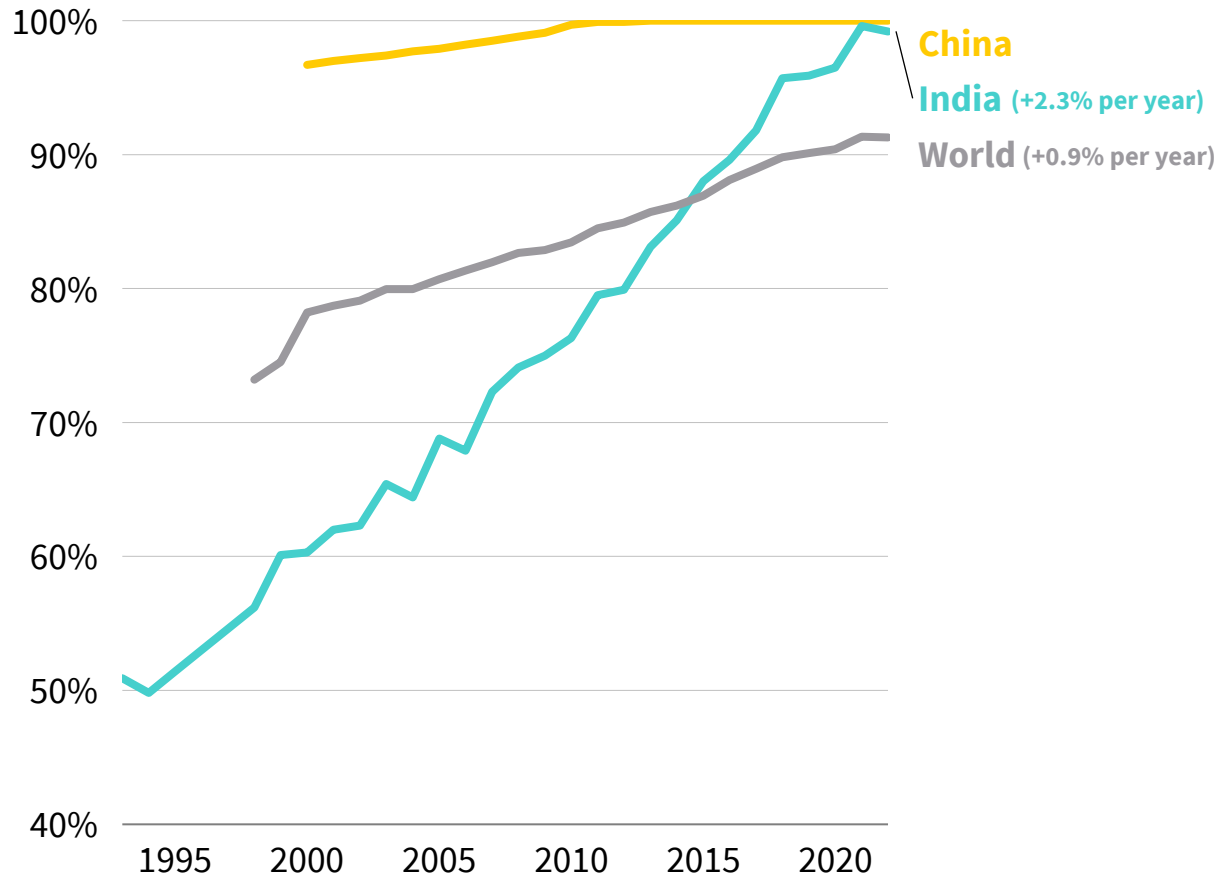
- **PM Surya Ghar Program** from the national government, aimed at solarizing 10 million homes by 2027
- **Clear local targets and tracking**, roughly doubling the national average in solarized households per capita
- **Doubling the number of market vendors**, with banking institutions engaged to ensure access to finance
- **Enhanced consumer outreach**, including large-group registrations and awareness efforts on the ground
- **Streamlined digital processes for registration,** with portals for low-interest loans and grievance redressal

Source: RMI Can Rooftop Solar Power India's Cities? (2025)

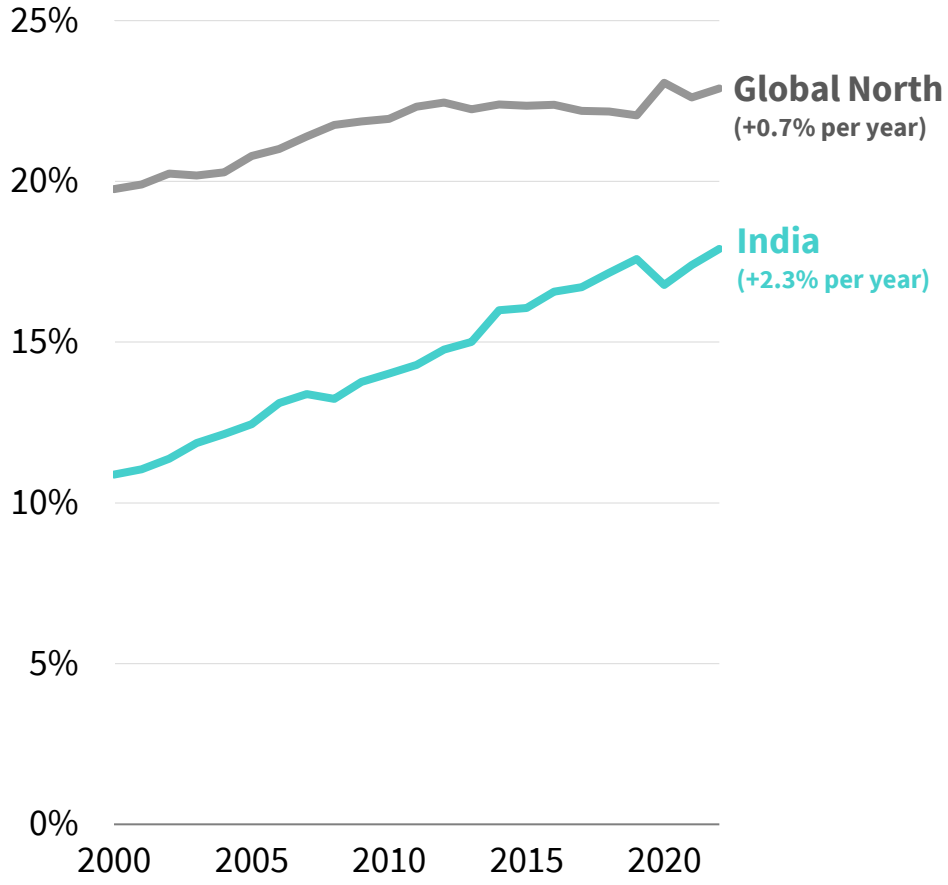
Electrification is growing fast, providing more secure energy access

Progress has been 3x faster than many other regions, both for access and for electricity's share of final energy

Share of the population with access to electricity



Electricity as a share of final energy consumption

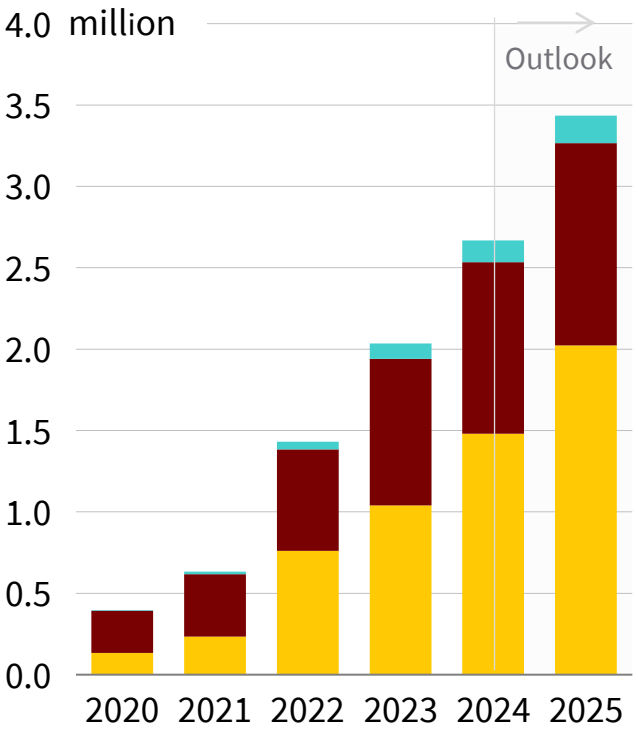


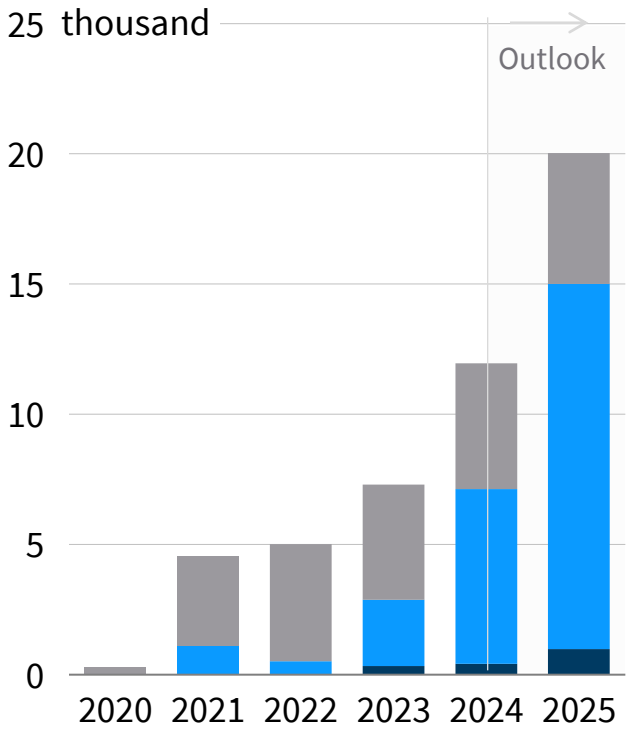
Note: Access is defined as having an electricity source that can provide basic lighting and charge a phone or power a radio for 4 hours per day. Percentages per year are compound annual growth rates.
Source: IEA World Energy Balances, World Bank, Our World in Data, RMI analysis

Electric vehicles are rising rapidly, avoiding costly oil imports

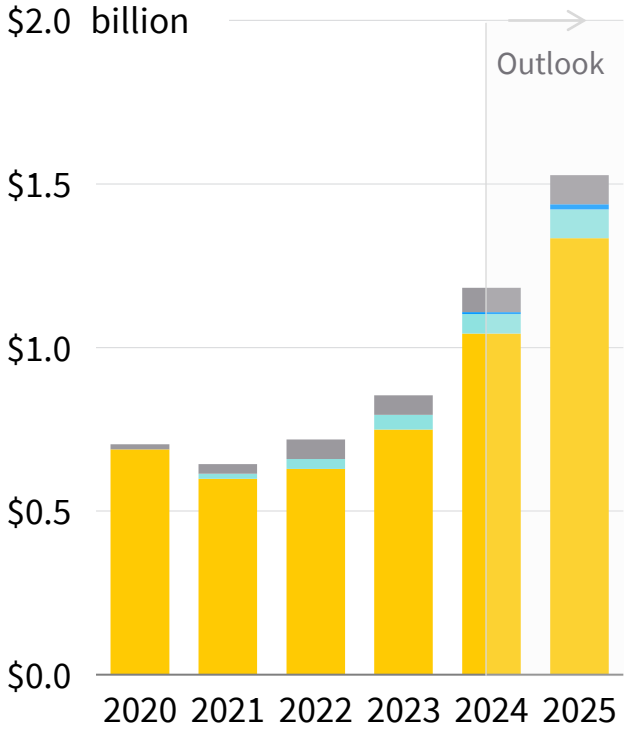
Two- and three-wheelers lead the way, with all sectors on track to accelerate

Sales of electric vehicles





Oil imports saved



Two-wheelers | Three-wheelers | Passenger vehicles | Medium- & heavy-duty trucks | Light-duty trucks | Buses

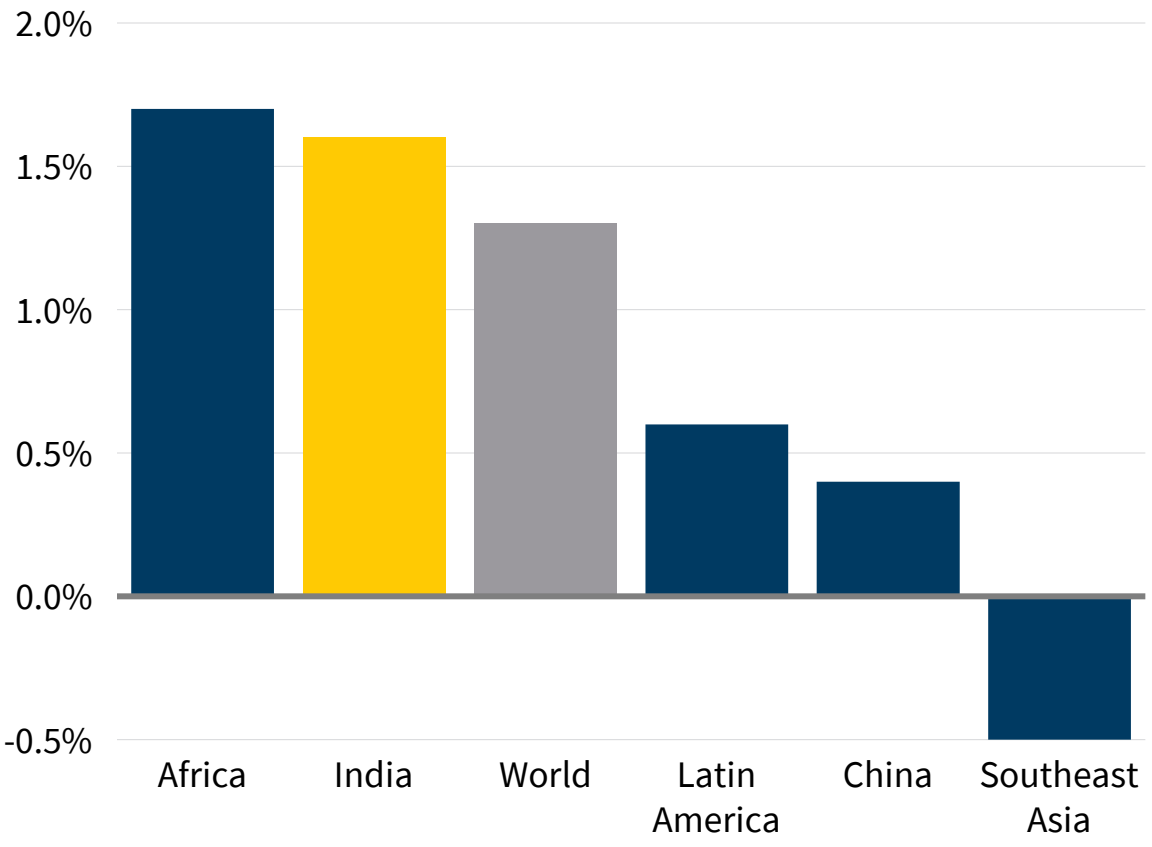
Note: Three-wheelers not included in oil displacement analysis. As of April 2025, $1.5 billion = ₹130 billion (hundred crore).

Source: BNEF Long-Term Vehicle Outlook (2024), Economic Transition Scenario; RMI analysis

India is also outpacing many regions in energy efficiency progress

Due to market incentives and policies across buildings, industry, and transportation

Estimated annual energy efficiency improvement, 2021–2024



Example efficiency actions in India

- **UJALA program**, the world's largest zero-subsidy initiative for LED light bulb production and finance
- **Energy Efficiency Services Limited initiatives**, which use demand aggregation for efficient appliances
- **Energy Conservation Building Codes**, which can save 25%–35% of energy demand if fully implemented
- **Perform, Achieve, and Trade scheme**, a successful market mechanism for saving energy in industry
- **Fuel economy standards and EV incentives**, for improving efficiency in the transportation sector

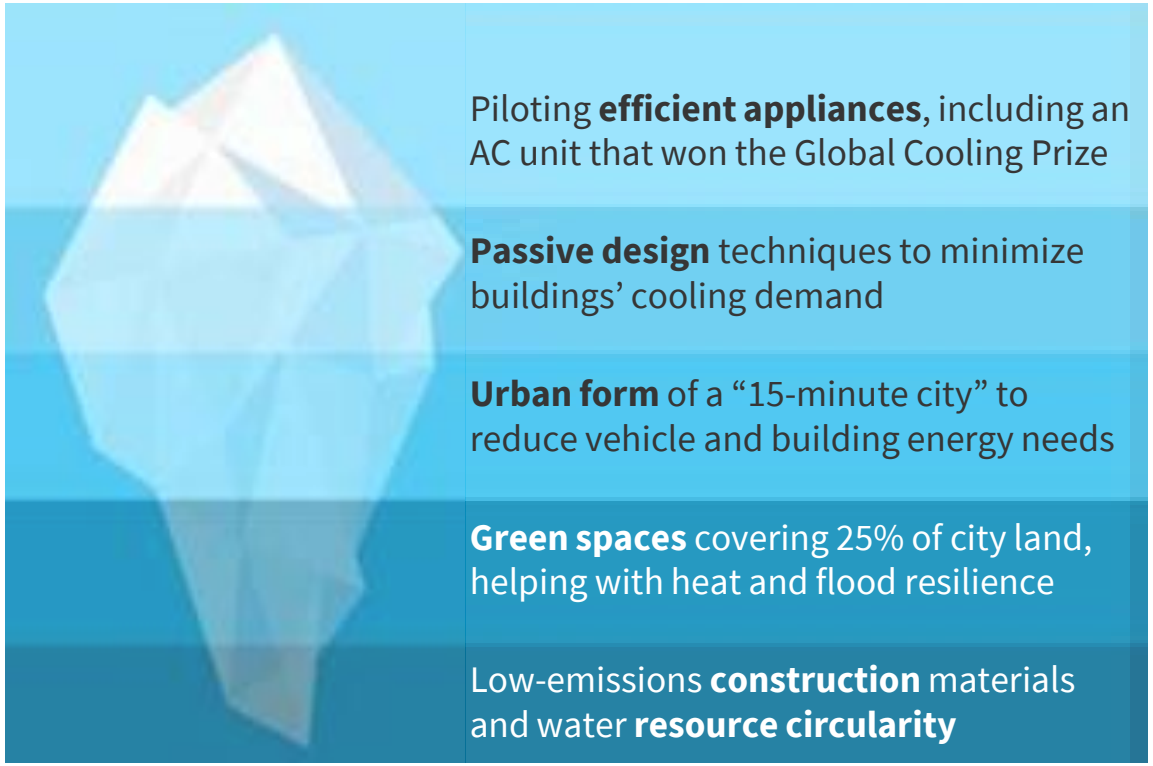
The IEA measures annual efficiency improvements as the percent change in primary energy intensity of GDP. UJALA = Unnat Jyoti Affordable LEDs for All.

Source: IEA Energy Efficiency (2024), Wood Mackenzie (2024)

Case study: energy efficiency in Palava City

Flagship net-zero energy city uses system-wide measures to exemplify sustainable urban living

With system efficiency, appliances are just the tip of the iceberg…



…helping the city thrive in sustainability and prosperity

30% more efficient home energy use
vs. industry benchmarks

100% of equivalent energy needs from solar
as a goal, via solar panels and water heaters

Only 4% of days with unhealthy air
(vs. 42% in nearby Mumbai)

2ºC cooler than Mumbai, saving energy and lives during deadly heat waves

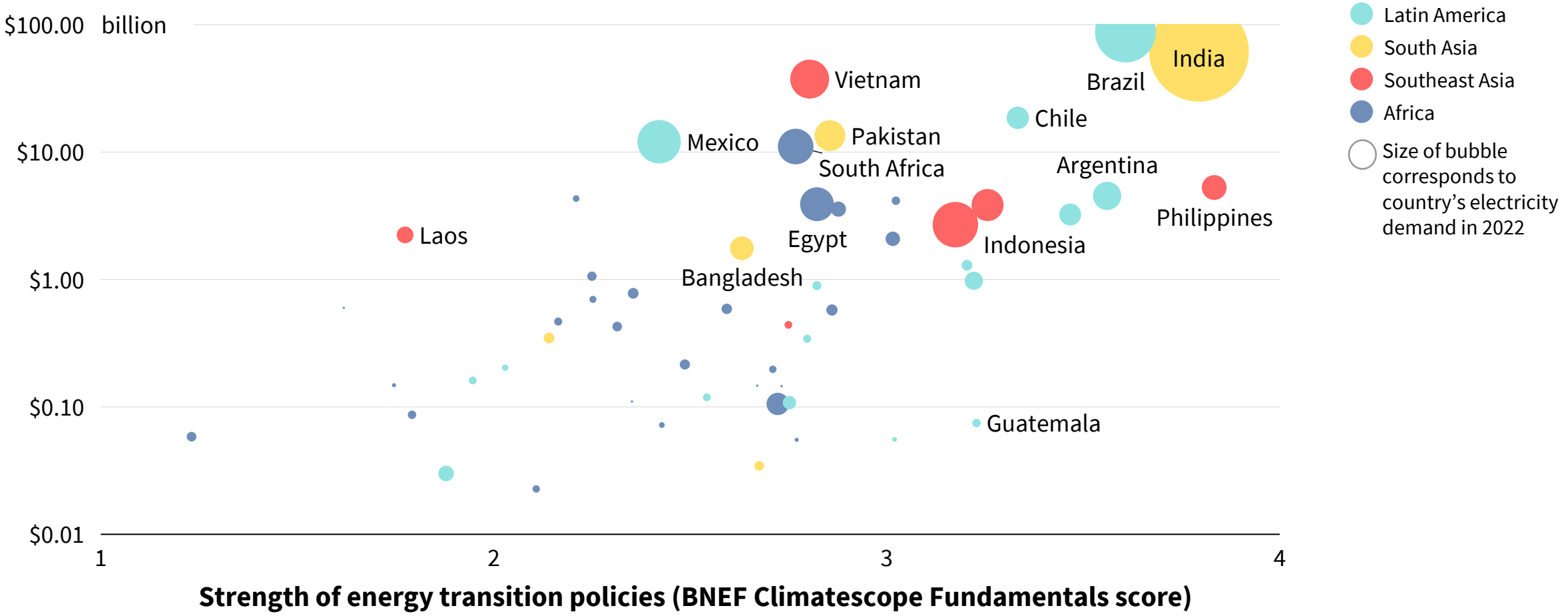
$1 billion in annual buildings revenue
expected after scale-up by the Lodha Group

Source: RMI (2023), Lodha Group (2025)

As we look ahead, India's policies make it attractive for investment

Good policy attracts investment — and India is leading on both across emerging economies

Investment in renewable energy (2019–23)



Source: BNEF Climatescope (2024), IEA World Energy Balances for electricity demand, RMI framing

As policy support continues, cleantech investment will surge

Reasons for growth: long-term goals

- 500 GW (50%) of **power capacity from non-fossil sources** by 2031–32, with the percentage target met in 2025
- 208 GWh of **battery storage** by 2030, from 2 GWh in 2024
- **EV sales share** of 80% for two- and three-wheelers by 2030, and 30% for private cars
- **Doubling energy efficiency improvements**, with savings by 2030 that are equivalent to 10% of current energy use
- 45% **lower emissions intensity** in 2030 vs. 2005 levels

Reasons for growth: near-term Union Budget

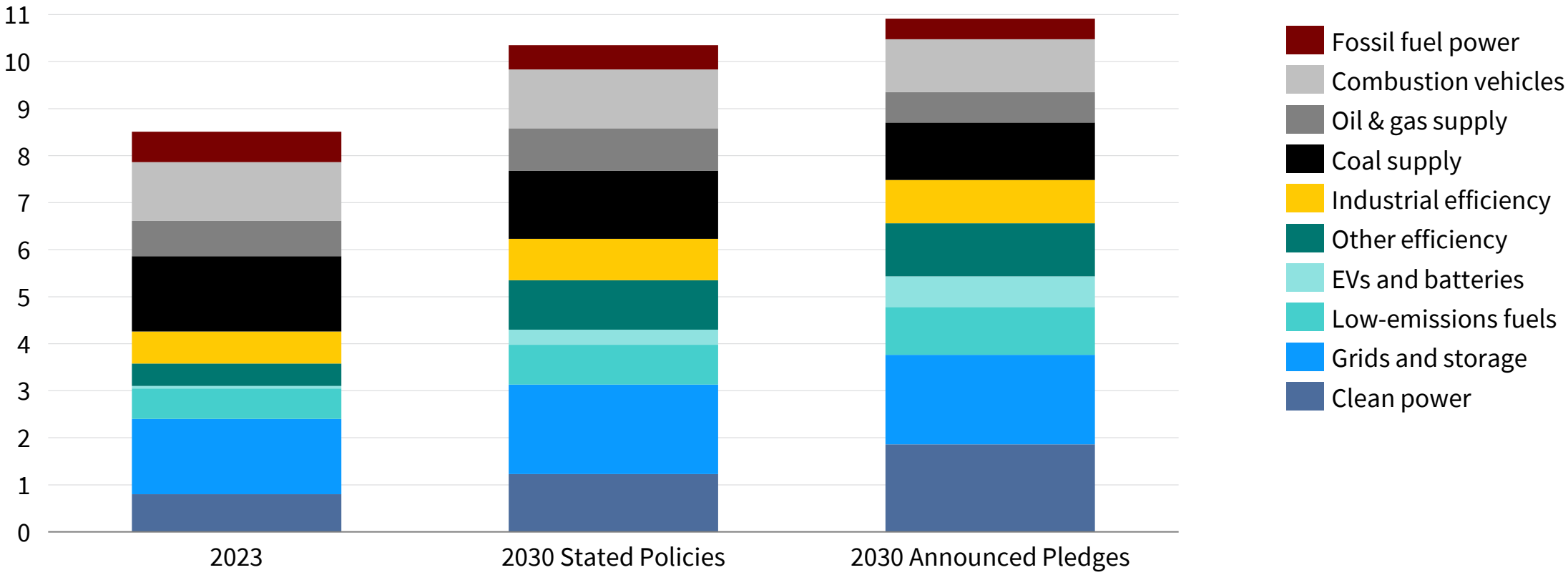
- **80% increase in solar project funding**
- **Double the investment for green hydrogen,** in line with India's National Mission
- **National Manufacturing Mission** and tax measures to strengthen domestic EV production
- **Incentives for regulatory reform** to encourage renewable energy
- **R&D funding** for further innovation

Source: RMI analysis, CEEW Centre for Energy Finance (2020), Carbon Copy (2025), Government of India (2025), BNEF India Market Outlook (2025)

The energy transition provides millions more jobs for India

Clean sources will add at least 4x more jobs than fossil fuels might lose

Millions of energy jobs in India



Note: STEPS = Stated Policies Scenario, APS = Announced Pledges Scenario. Sectoral manufacturing jobs are included.
Source: IEA World Energy Employment (2024), RMI analysis

With the cost of heat, solutions are an economic opportunity

More than half of heat's global labor effects are in India, but actions can drastically reduce future impacts

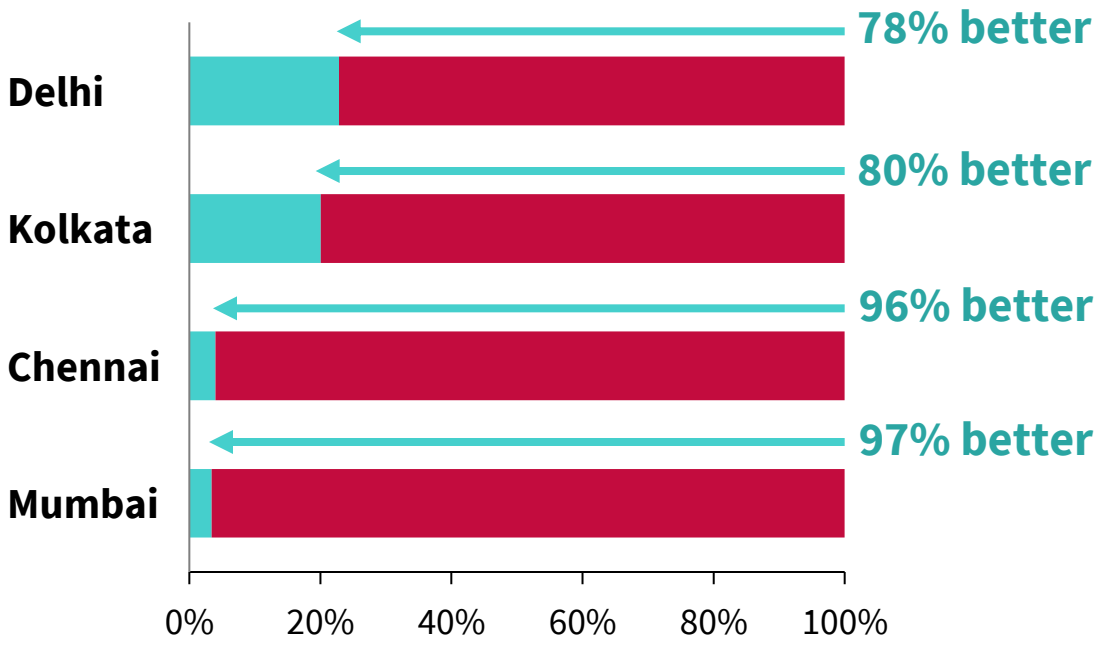
Past annual costs of extreme heat (2001–2020 average)

259 billion labor hours

Thousands of deaths

$624 billion (₹54 trillion)

Fraction of hot-hours at 2°C vs. 3°C of warming



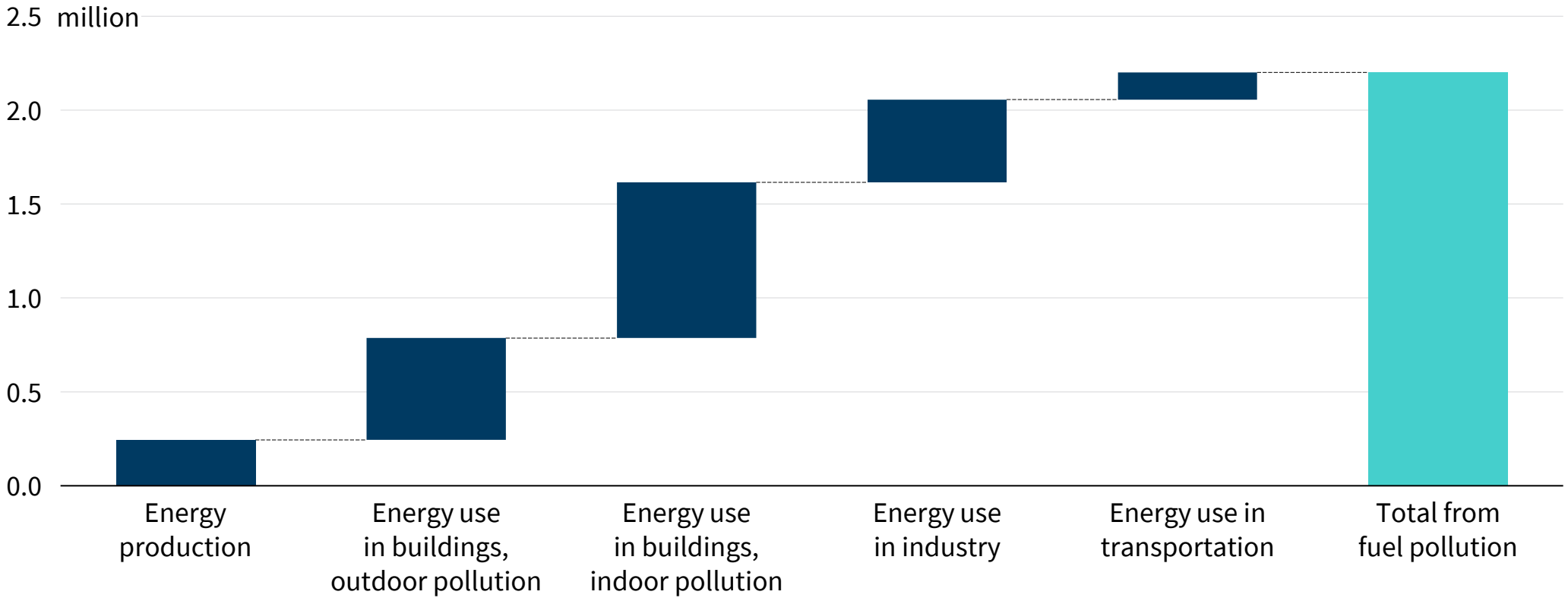
Note: Monetary costs are based on 2017 USD and PPP exchange rates. The threshold for a hot-hour varies by location and is empirically defined by Vecellio et al. (2023).

Source: Parsons et al. (2022), de Bont et al. (2024), Vecellio et al. (2023)

Solutions can curb air pollution, which causes 1 in 4 deaths in India

With the potential to save 2.2 million lives every year, more than the deaths from any other risk factor

Human lives we can save every year with clean energy



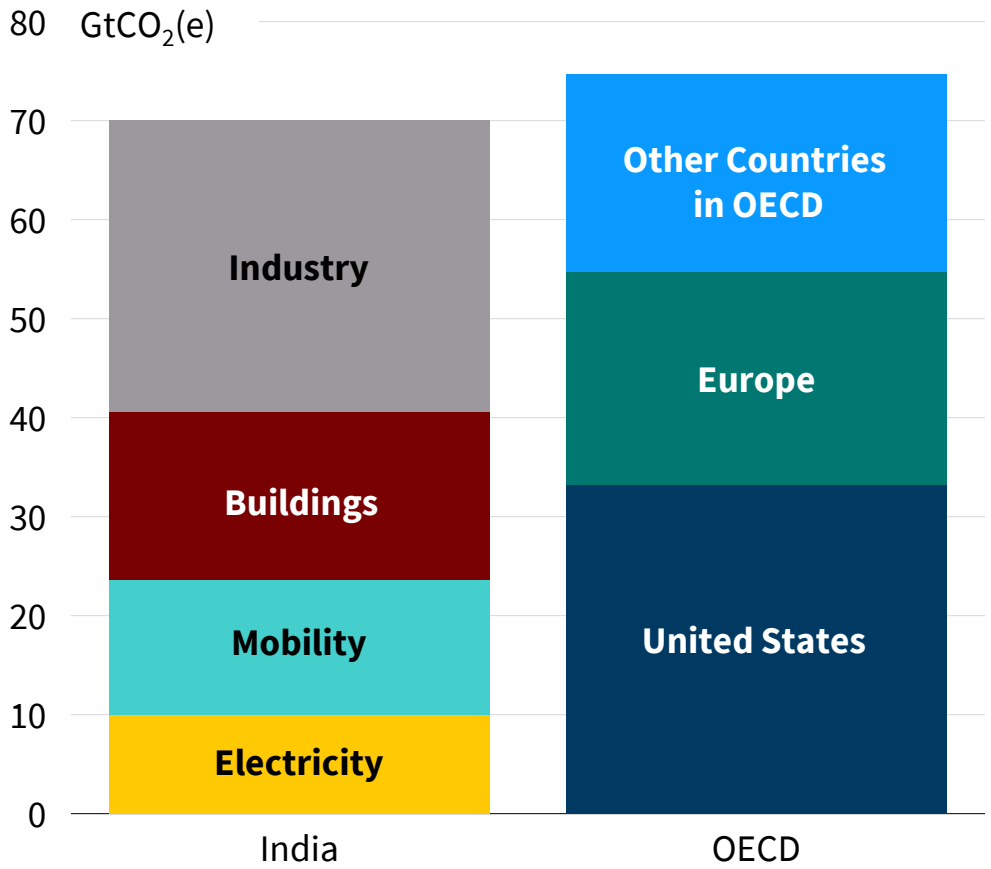
Blue bars show fuel pollution deaths in 2019 which can be avoided by clean energy. Estimates are conservative as they do not include other benefits of clean energy.

Source: Jaganathan et al. (2024), Lelieveld et al. (2023), McDuffie et al. (2021), WHO (2024)

Most of all, the transition can cut costs and raise revenue

While saving more emissions than the US and Europe combined

Potential cumulative CO_2 reductions through midcentury



Example economic benefits, annually

₹7 lakh crore ($81 billion) in midcentury savings from electricity system costs with a cleaner grid

₹13 lakh crore ($147 billion) in midcentury savings by avoiding oil imports for road transportation

₹54 hundred crore ($620 million) in revenue from feasible methane reductions in energy production

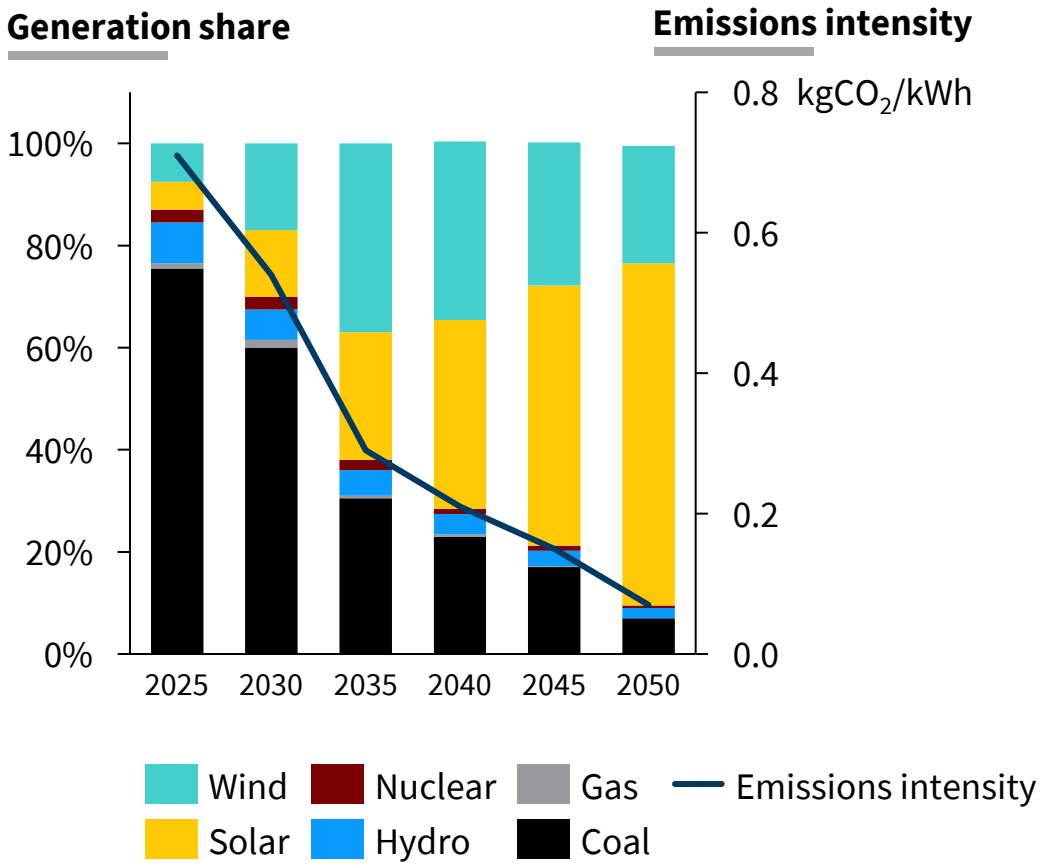
Note: CO_2e = CO_2-equivalent using a 100-year global warming potential. Estimates for India's buildings and industry include minor amounts of other greenhouse gases; all other bars are CO_2 only. See sectoral slides for precise time frames included. All emissions reductions are relative to a source-specific baseline scenario. Clean electricity also contributes to savings in other sectors.

Source: TERI (2024), RMI India (2024-25), WRI India (2025), IEA Methane Tracker (2025) for India; IEA World Energy Outlook (2024) Stated Policies vs. Announced Pledges Scenarios for OECD

Electricity: renewable energy can power 90% of the grid by 2050

Saving ₹7 lakh crore ($81 billion) in 2050, equivalent to 30%–40% lower electricity system costs

Results of least-cost scenario



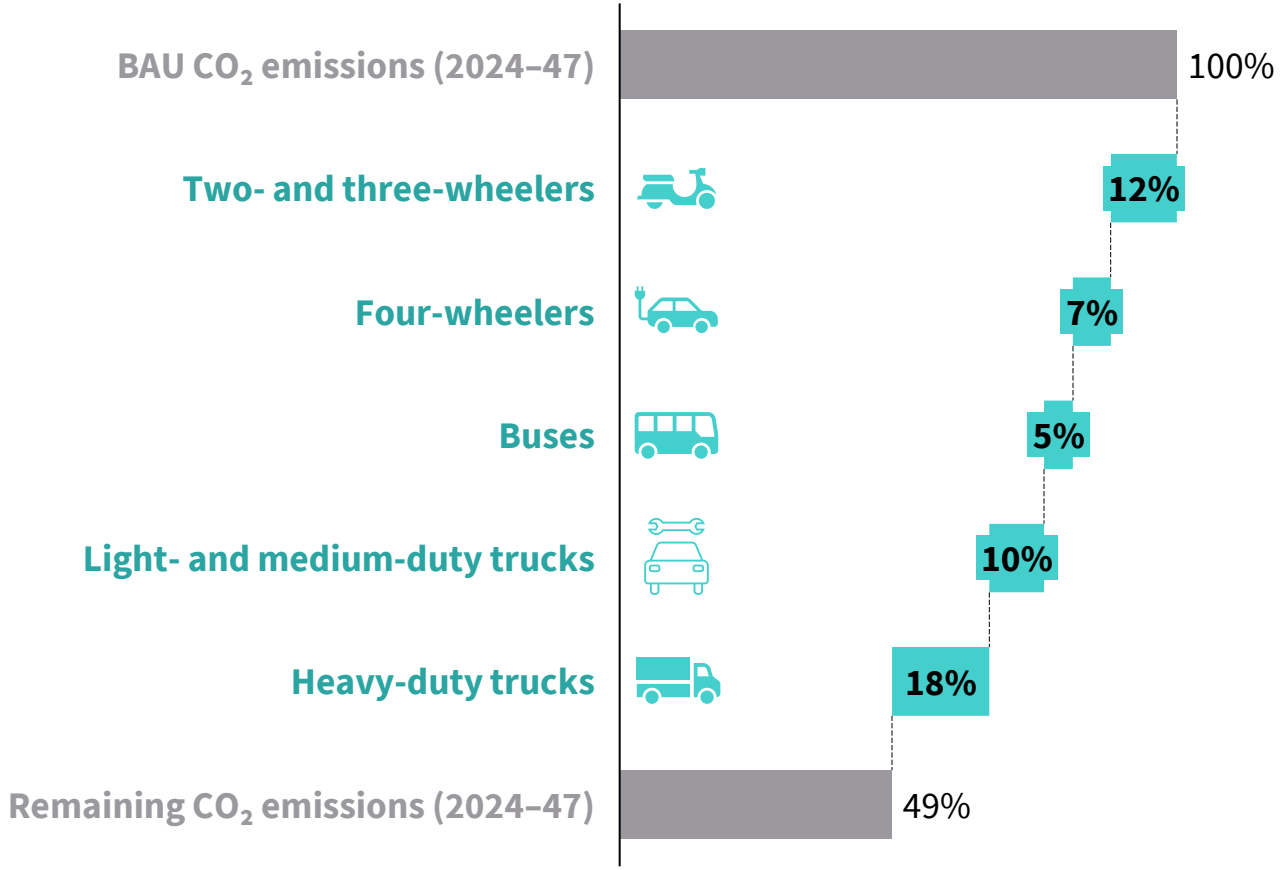
Via five key actions across technologies

- **Reform market design and operations** for a cleaner grid
- Streamline market and policies for **grid storage and demand flexibility**
- **Bridge green premium gaps** for certain technologies
- **Mainstream reliability and resilience** in planning and investment
- **Invest in optimized grid infrastructure** and asset management

Source: TERI (2024): India's Electricity Transition Pathways to 2050 *for least-cost scenario, RMI India for five key actions*

Mobility: accelerated action can save a cumulative $2 trillion in oil imports

With 90% lower sectoral imports and emissions in the year 2050, led by electric trucks and two-wheelers*



Not including urban planning, which can cut 2050 mobility emissions by one-third or more

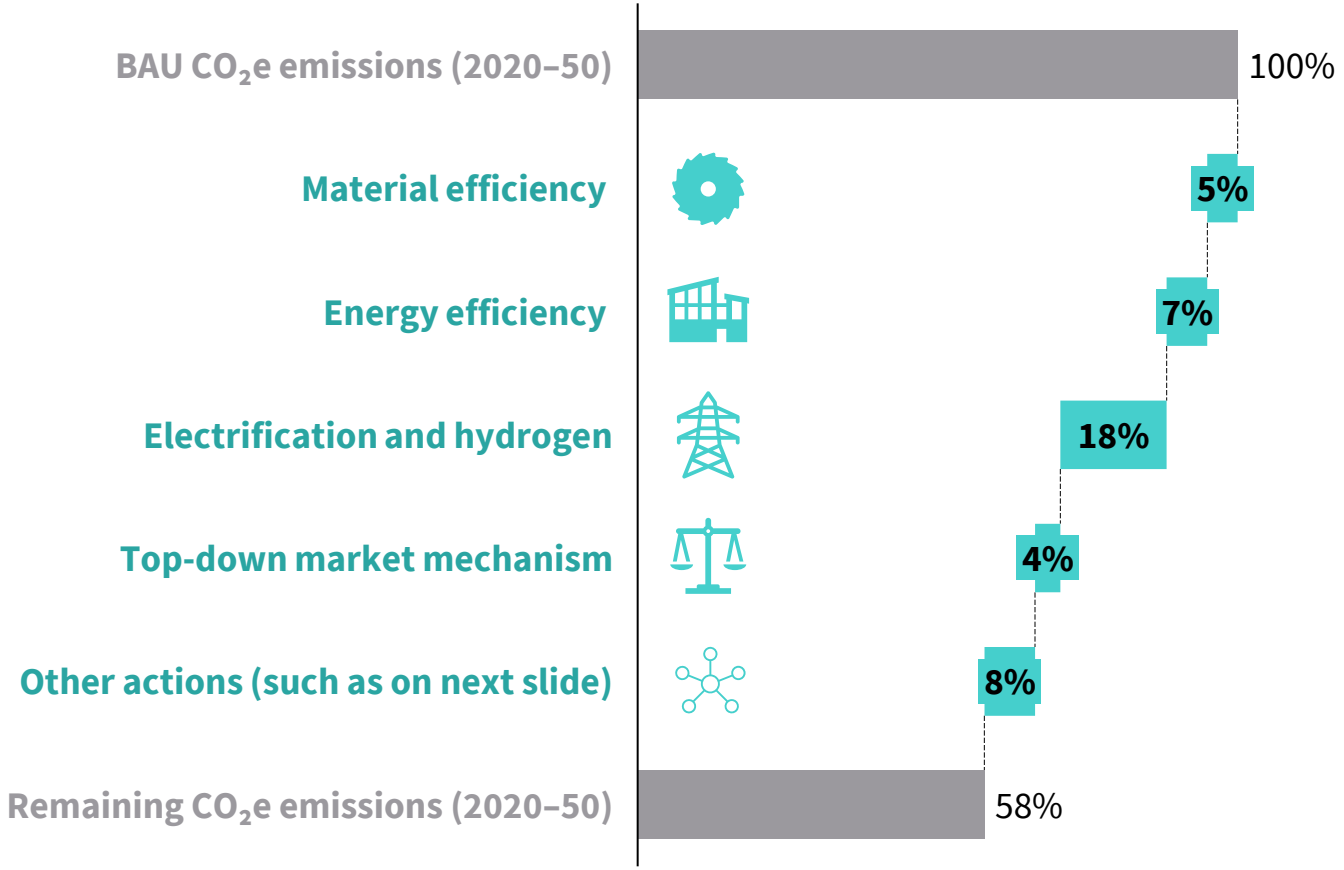
Via five key actions across vehicle types

- Comprehensive supply- and demand-side **policies**
- Accessible, affordable, and safe EV **infrastructure**
- Innovative **financing** mechanisms to de-risk adoption
- **Clean electricity** by 2045 to power EV charging
- Domestic EV **production** and a battery **circular economy**

Source: RMI India (2024): India at 2047*; IPCC AR6 WGIII Chapter 5 Supplementary Material (urban planning estimate)*

Industry: efficiency and electrification lead a full system of solutions

Major progress is possible across steel, cement, chemicals, mining, and more



Via five key actions across sectors

- **Invest in finance**, especially for smaller enterprises
- **Elevate demand-side policies**, such as on circularity
- **Build domestic manufacturing** for cleantech products
- **Support R&D to innovate**, such as on green steel
- **Provide workforce training** to implement solutions

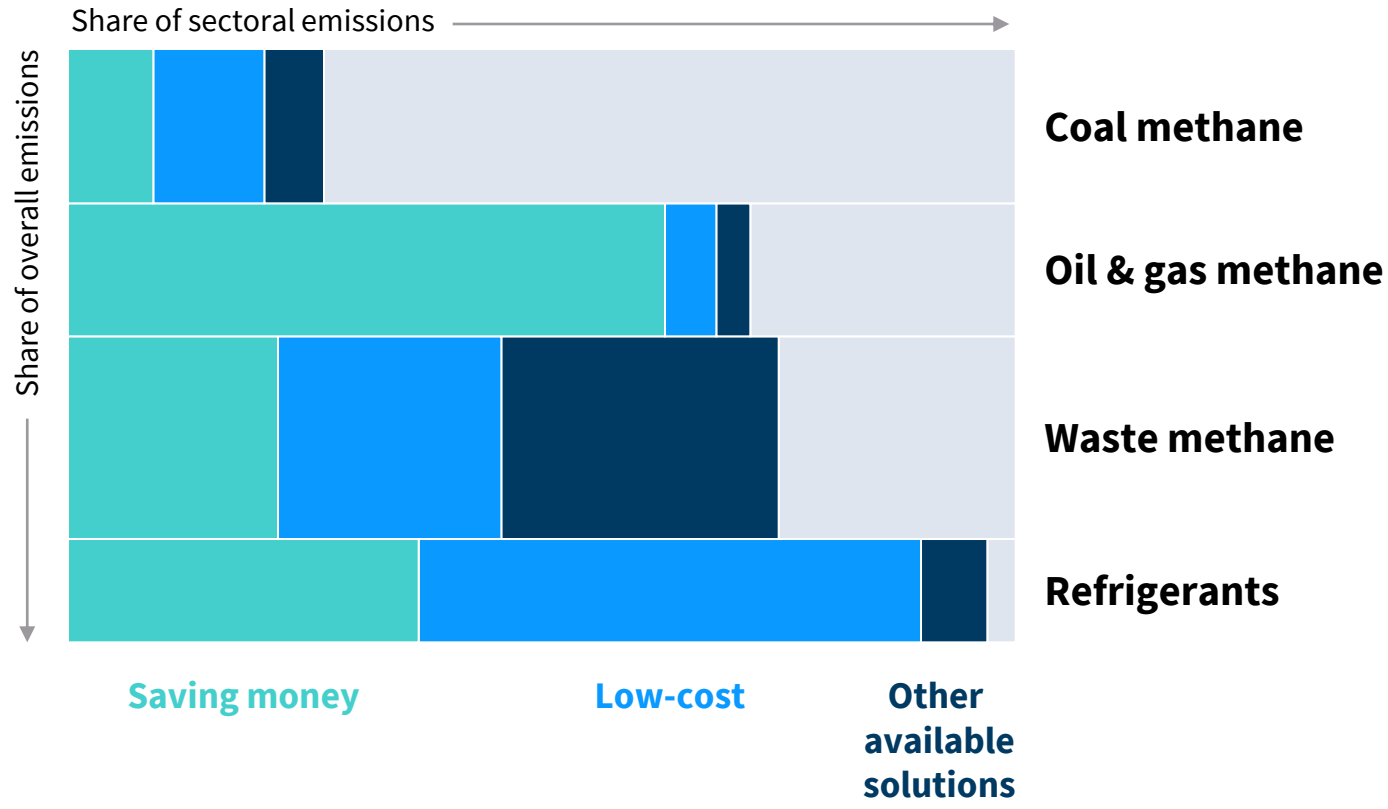
Note: CO_2e = CO_2-equivalent using a 100-year Global Warming Potential.

Source: WRI Pathways to Net Zero: Policies and Measures for Industrial Decarbonization in India *(2025)*

Beyond CO_2 emissions, curbing pollution brings savings and revenue

Saving millions of lives and earning ₹54 billion ($620 million) annually from fossil fuel methane action alone

Energy-related non-CO_2 emissions that can be avoided…



…via cross-sector actions such as:

- **Data transparency**, via comprehensive monitoring and inventory work
- **Holistic inclusion in policy initiatives**, such as the future Indian Carbon Market
- **Using the waste management hierarchy** to prioritize full-system solutions
- **Revised metrics to remove bottlenecks**, including for air conditioner ratings
- **Innovation and finance** to scale more nascent solutions

Note: Low-cost measures are below $20/tCO$_2$e (using a 100-year global warming potential). Y axis weighting is based on current emissions using the same equivalency.

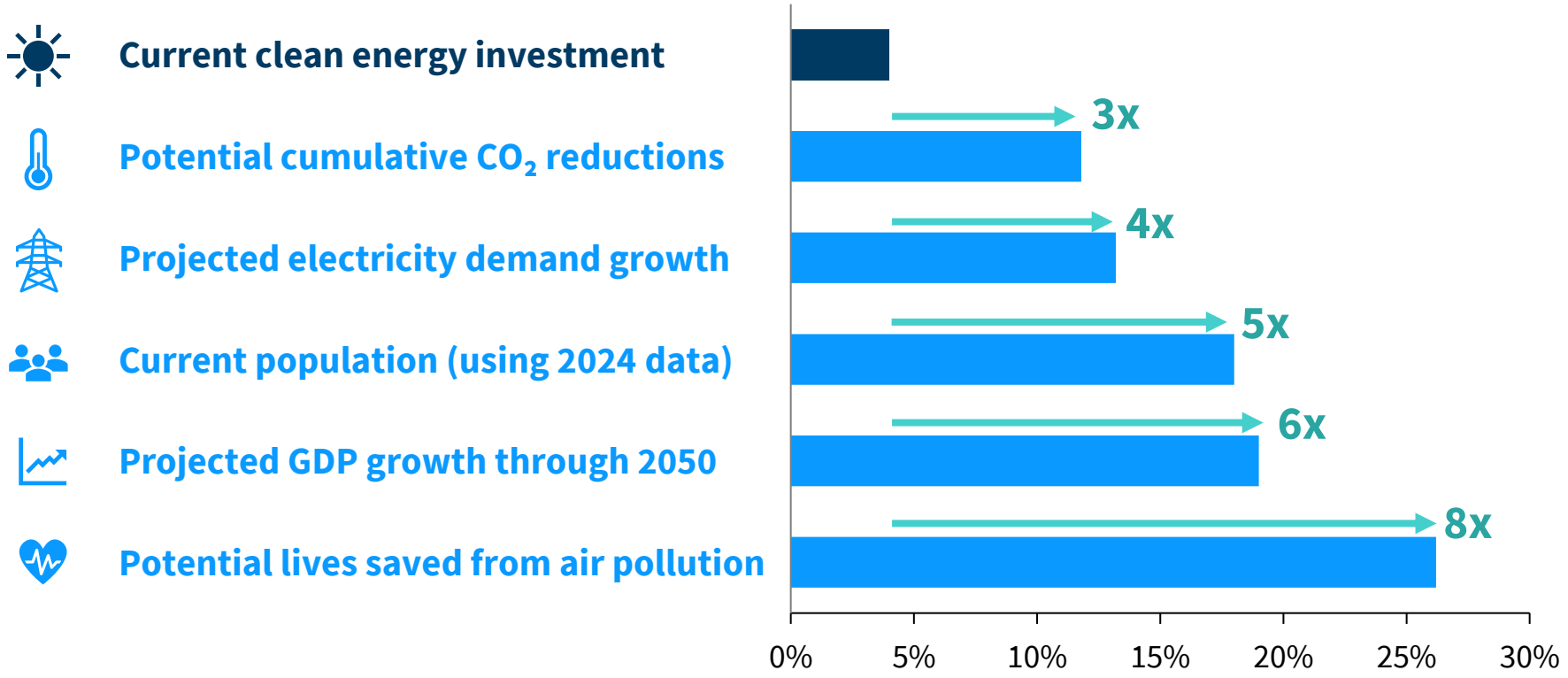
Source: IEA Methane Tracker (2025), Shindell et al. (2024), Osho (2024), IGSD (2024), Hillenbrand et al. (2022), U.S. EPA (2019), RMI analysis

India's investment gap is a massive opportunity, locally and globally

If India's share of clean energy investment grows to its share of global impact, there will be broader benefits for all

India's share of...

Growth opportunity to match the rest of the world



Note: Growth and emissions are between 2023 and 2050. Growth opportunity is defined as the growth needed for India to meet the rest of the world in terms of clean energy investment per unit of impact.

Source: IEA World Energy Investment (2024), World Energy Outlook (2024), RMI analysis

Empowering India: The clean energy growth opportunity

Moderated Q&A

Thank you for attending!

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QR code to event page (recording, link to resources)