Transforming Energy Sector Infrastructure

An Indian Perspective

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Geneva, Switzerland

Global Methane Initiative
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Impacting sustainable development at scale with data, integrated analysis, and strategic outreach

TRANSFORMATIONS

- Low-carbon Economy
- Energy Transitions
- Power Markets
- Industrial Sustainability
- Sustainable Livelihoods

QUALITY OF LIFE

- Clean Air
- Sustainable Water
- Sustainable Food Systems
- Sustainable Cooling
- Sustainable Mobility

ENABLERS

- Sustainable Finance
- Technology Futures
- Circular Economy
- Climate Resilience
- International Cooperation

200+
Multidisciplinary team

320+
Peer-reviewed publications

160+
Instances of increased data transparency

460+
Roundtables & conferences

22
Indian states engaged

110+
Bilateral & multilateral initiatives promoted

SPECIAL INITIATIVES

- CEEW Centre for Energy Finance
- Powering Livelihoods
- Emerging Economies
- UP State Office

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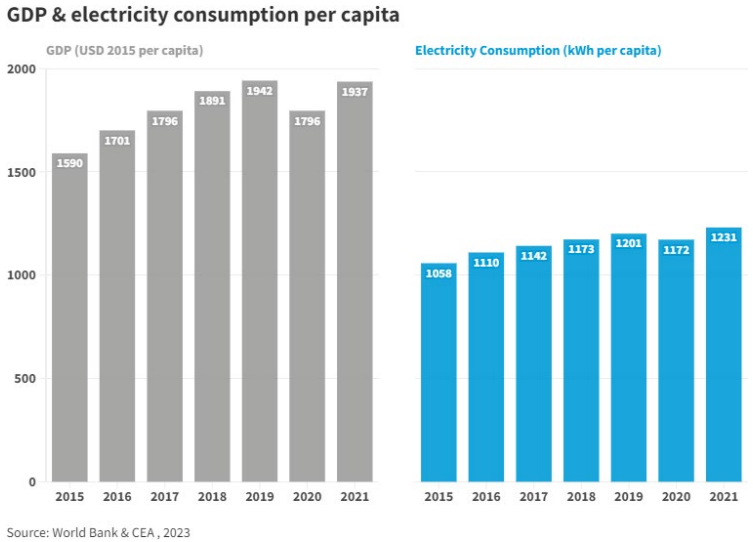
Current status of the energy system in India

Current Status: Access to energy in India

	2015	2020
Clean cooking	44%	71%
Electricity Access	88%	97%



Source: World Bank & CEA , 2023

- There has been increased access to clean cooking and electricity within the country
- Two primary reasons for this increase: policy support through Saubhagya and UJJWALA and an increase in incomes

- GDP per capita (constant) increased by 22% while electricity consumption per capita increased by 16% in the last 6 years

- US: 12,613 kWh/ capita
- China: 5,845 kWh/capita
- UK: 4,266 kWh/ capita

Source: IRIS CEEW 2020 and IEA 2021

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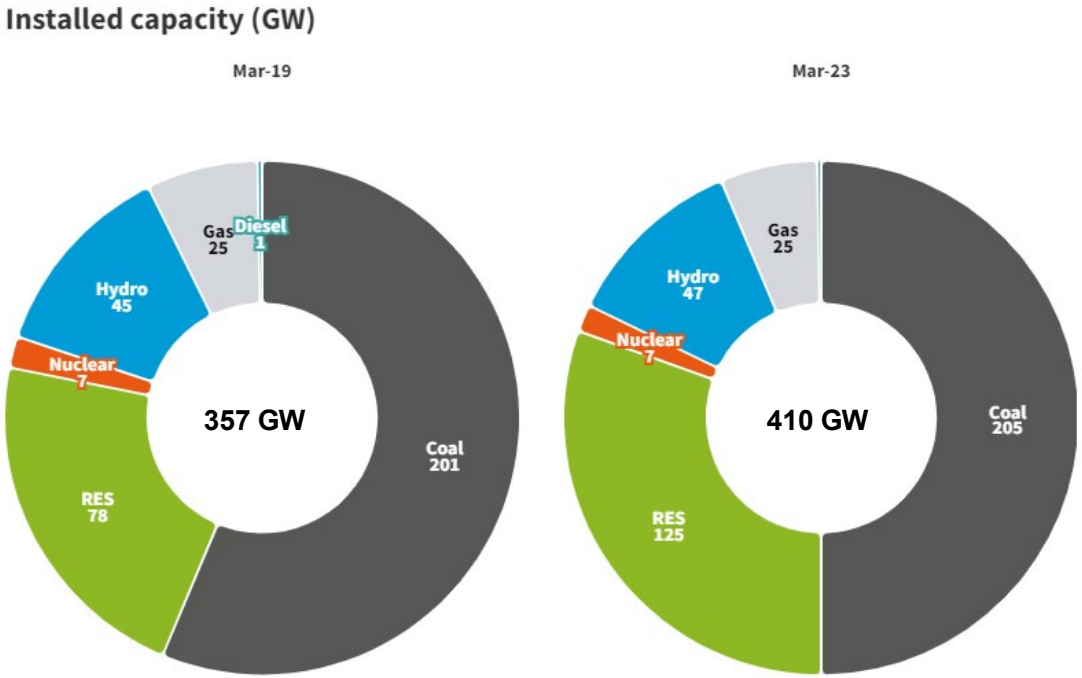
Energy Infrastructure: Renewable energy capacity up by 60% in the last 4 years



- About 30% of installed capacity is renewable energy compared to 21% 4 years back.

CEA 2023

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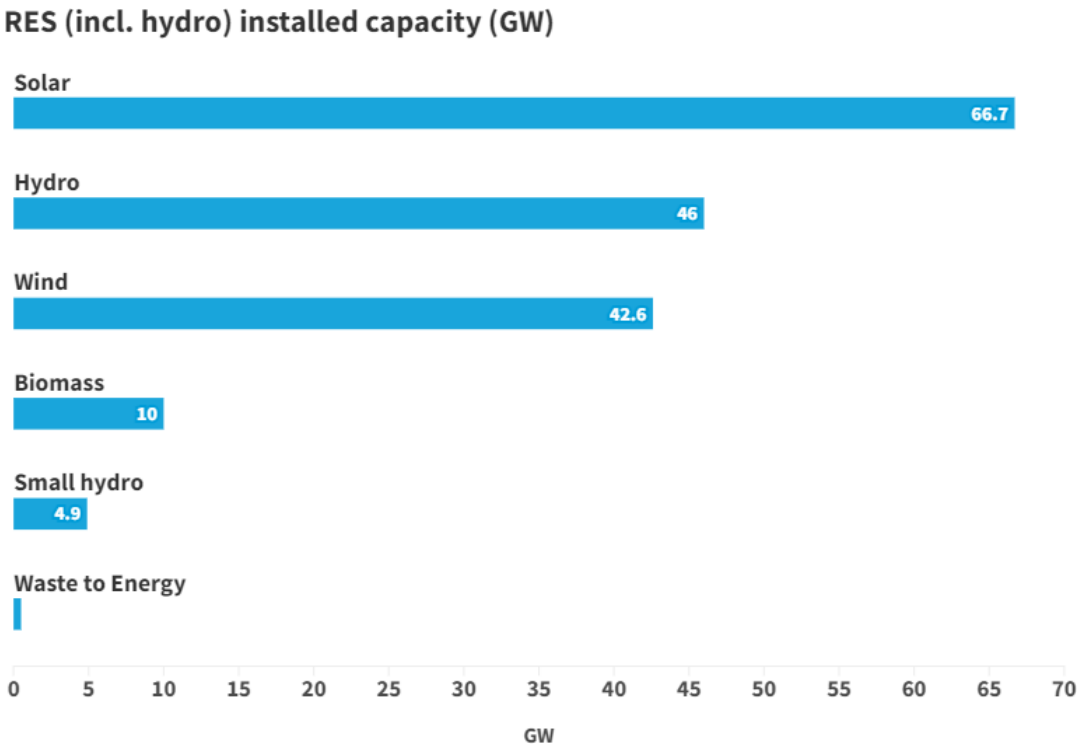
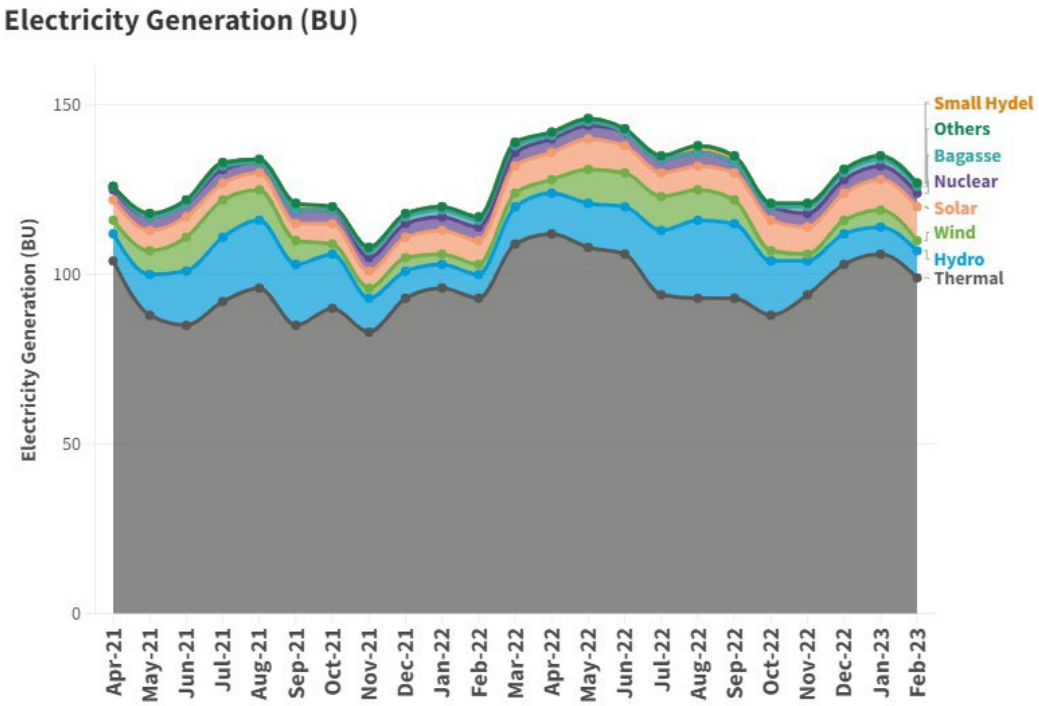
Energy Infrastructure: Solar is leading the way in renewable energy installations



- Together RES (incl. hydro) and nuclear make up about **43.6%** of total installed capacity

https://powermin.gov.in/en/content/power-sector-glance-all-india

Energy generation: Coal dominates energy generation in absolute terms, yet its share has been falling



Source: CEA 2023

- April 21 about **83%** of total generation from coal by February 2023 about **78%** of total generation from coal

- RE generation is lower as their availability is intermittent leading to low capacity utilization factors

CEA 2023

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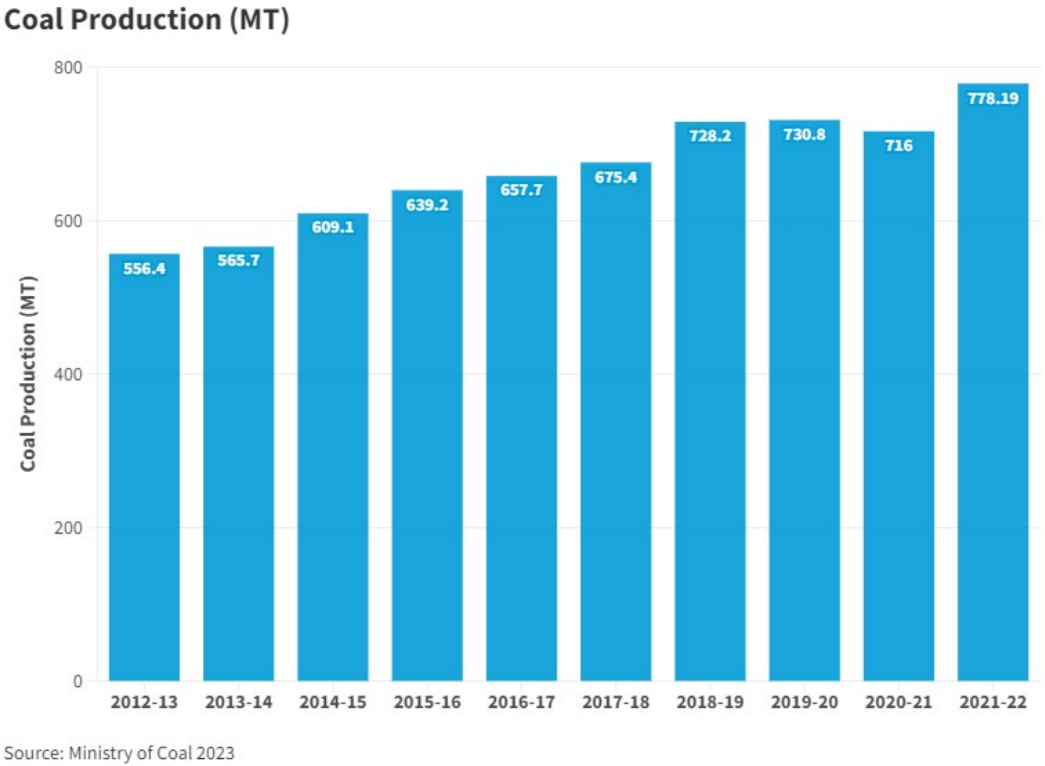
Energy Security: Steady growth in domestic coal production over the years



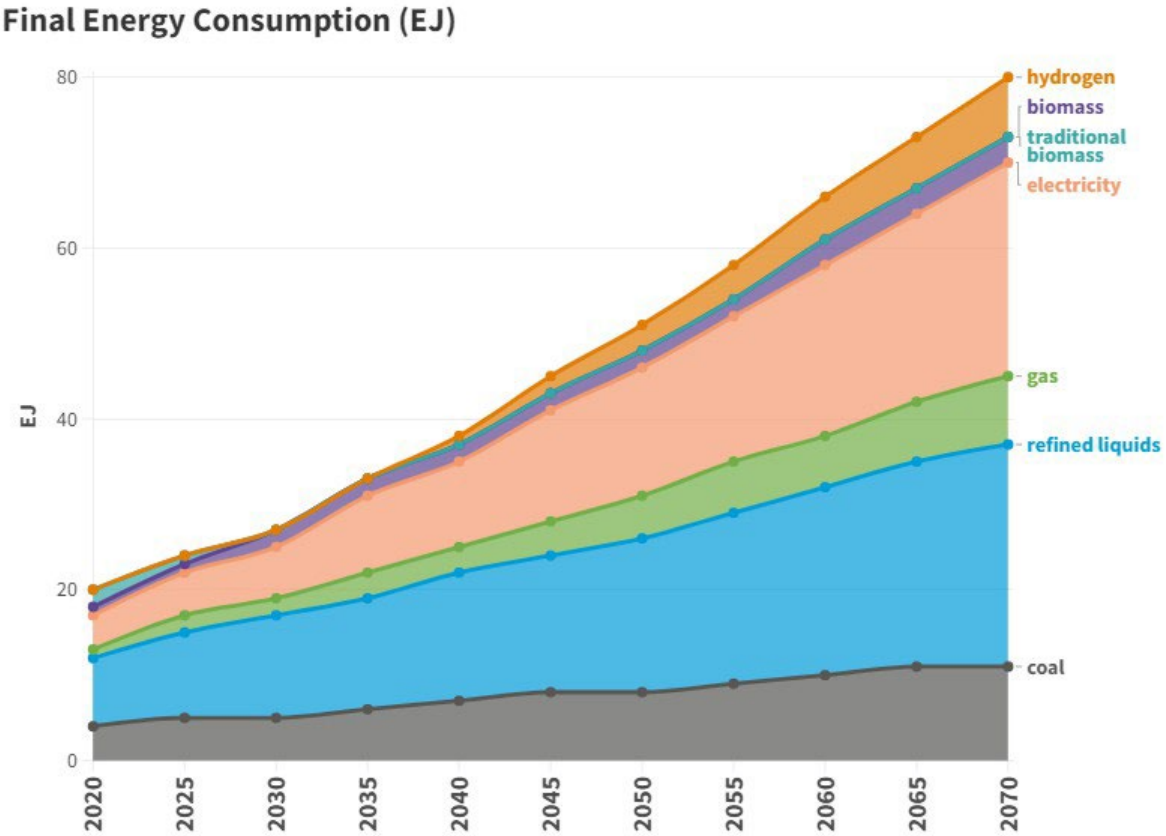
- Centre says domestic coal production to touch 1.31 billion tonnes by FY25 and 1.5 billion tonnes by FY30

https://indianexpress.com/article/business/economy/india-coal-production-2023-2024-8464233/

Future projections for India

BAU and NZ scenarios

Future trends in BAU: Fossil fuels continue to remain in the final energy

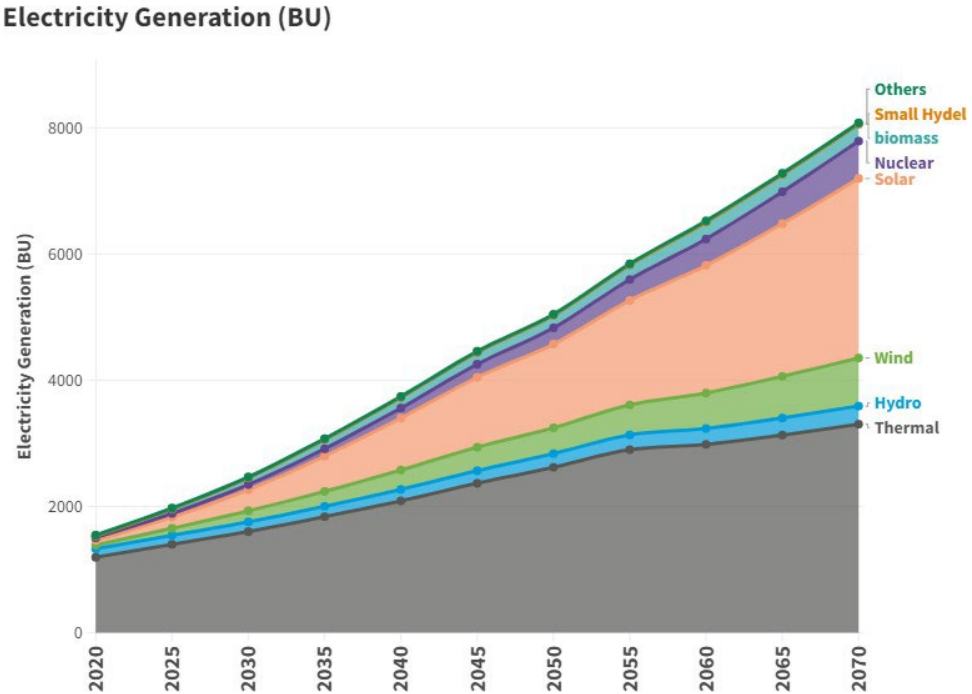


In a BAU scenario

- Electricity increases by 6.25 times between 2020 and 2070
- Overall final energy increases by 3.6 times

Author Analysis

Future trends in BAU: Coal dominates energy generation in absolute terms into the future

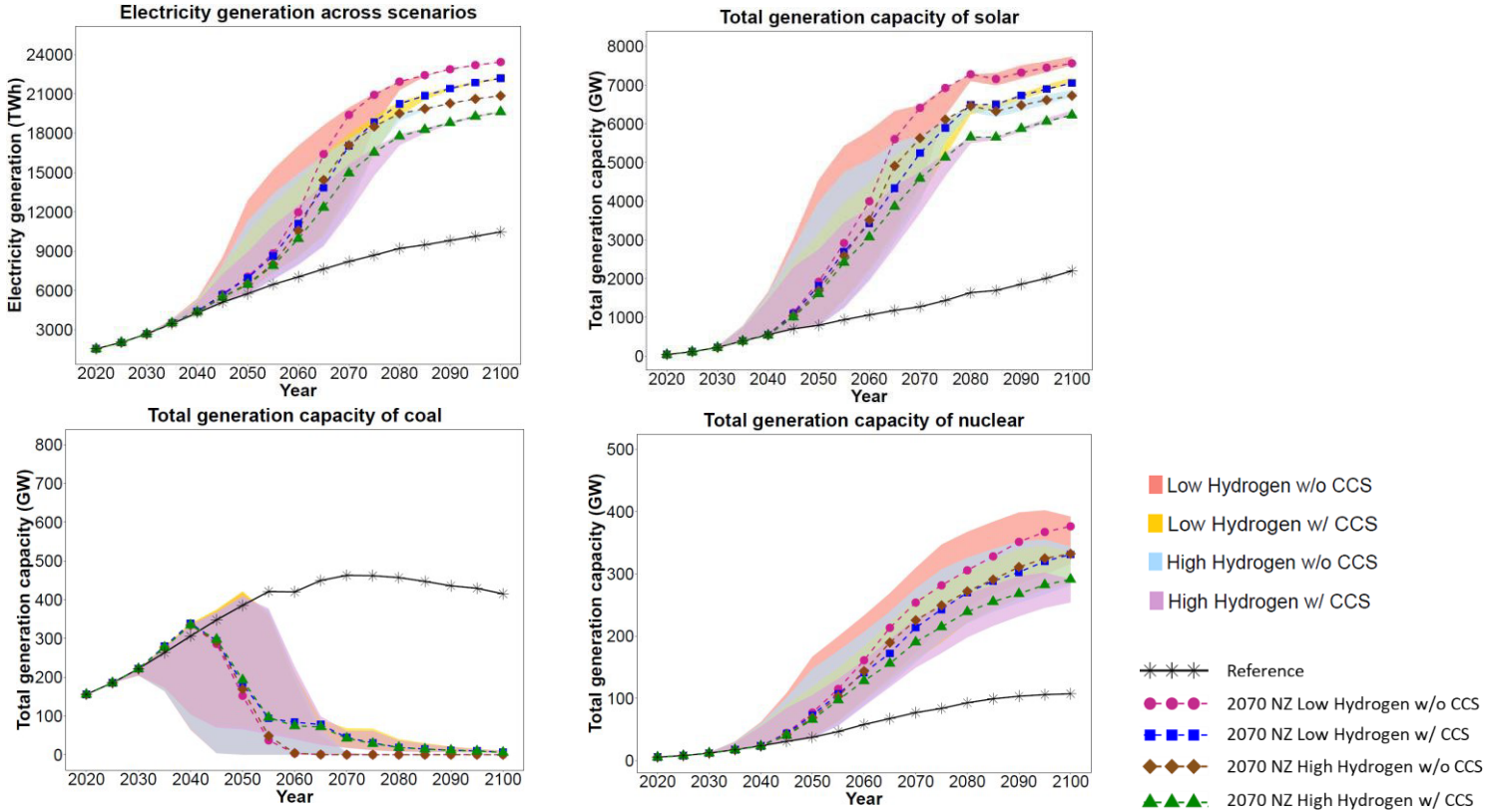


In a BAU scenario

- Coal generation triples between 2020 and 2070 while solar generation increases by 39 times.
- Overall electricity generation increases by 5 times

Author Analysis

Future Trends in NZ: Transitions in the electricity sector are going to be massive



Source: Chaturvedi and Malyan 2021

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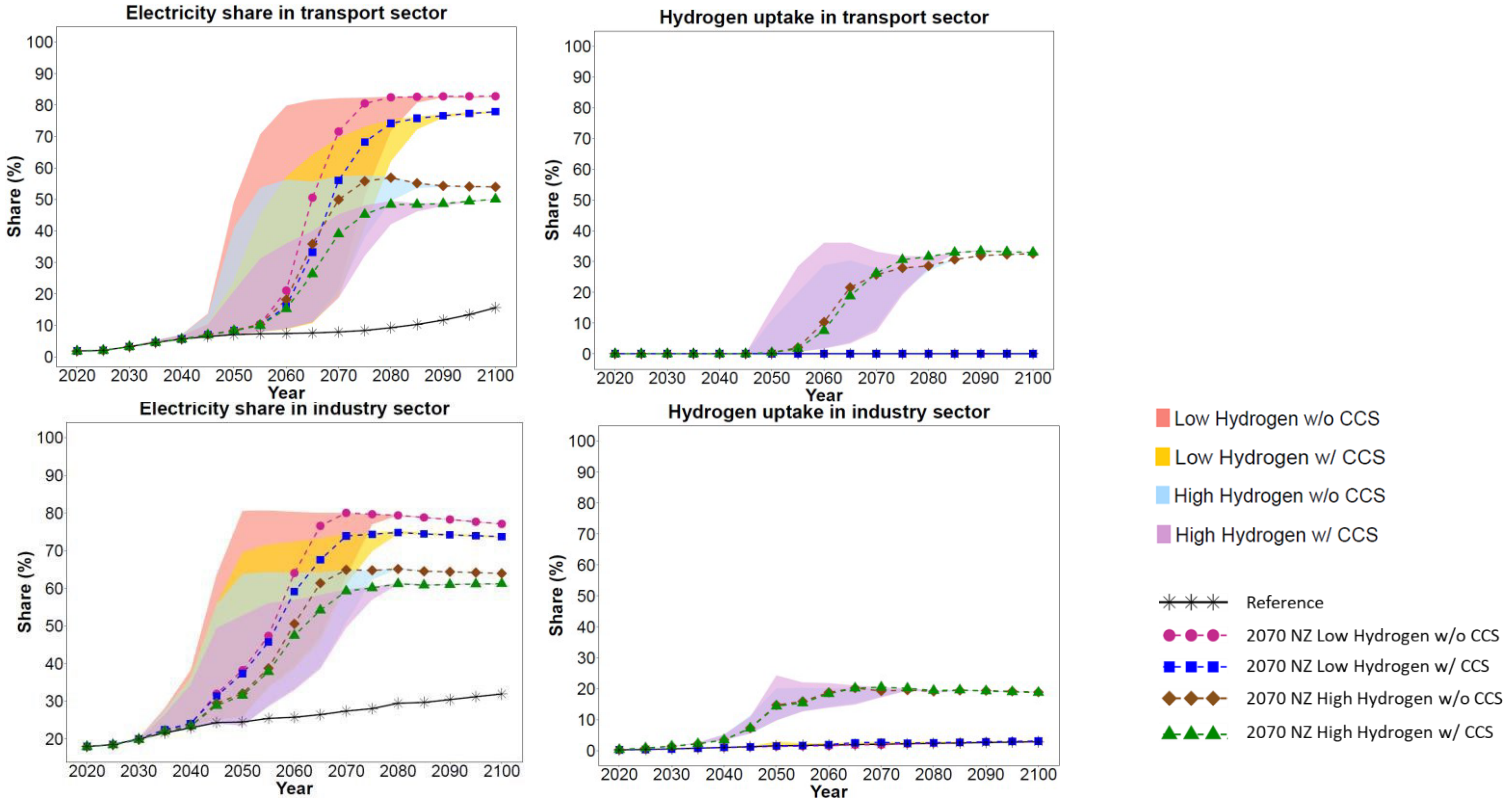
Future Trends in NZ: Transport and industrial sector will also need to redefine their energy architectures



Source: Chaturvedi and Malyan 2021

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Transforming the energy infrastructure

Energy Efficiency: Low hanging fruits

- Reduction in AT&C losses – currently AT&C stands at 20.81%
  - **Smart meters** – Better metering, billing and payment efficiencies. About 9.7 million smart meters have been installed so far, with a target of installing 250 million smart meters by 2025
  - **Grid modernisation** – Planning the grid infrastructure with RE evacuation

- Better Load Management
  - **Demand Shifting** – Power demand peaks in the evening when solar power is not available
  - **Time of Day Pricing** – Differential tariff based on time of day to reflect true power purchase costs utilities

- Energy efficient appliances
  - **Star-rating** for consumer awareness and diffusion of efficient appliances. This has seen great success in India

Energy Storage: Better integration of renewable energy

- Pumped hydro storage (PHS)
  - **Potential of 103 GW but currently only 4.7 GW**
  - Guidelines issued for PHS in 2023
  - Environmental impacts and clearance are the largest challenges for PHS

- Battery Energy Storage System (BESS)
  - **Target to have 4,000 MWh storage facility by FY 31**
  - Support through Viability Gap Funding for BESS

Mongabay 2023

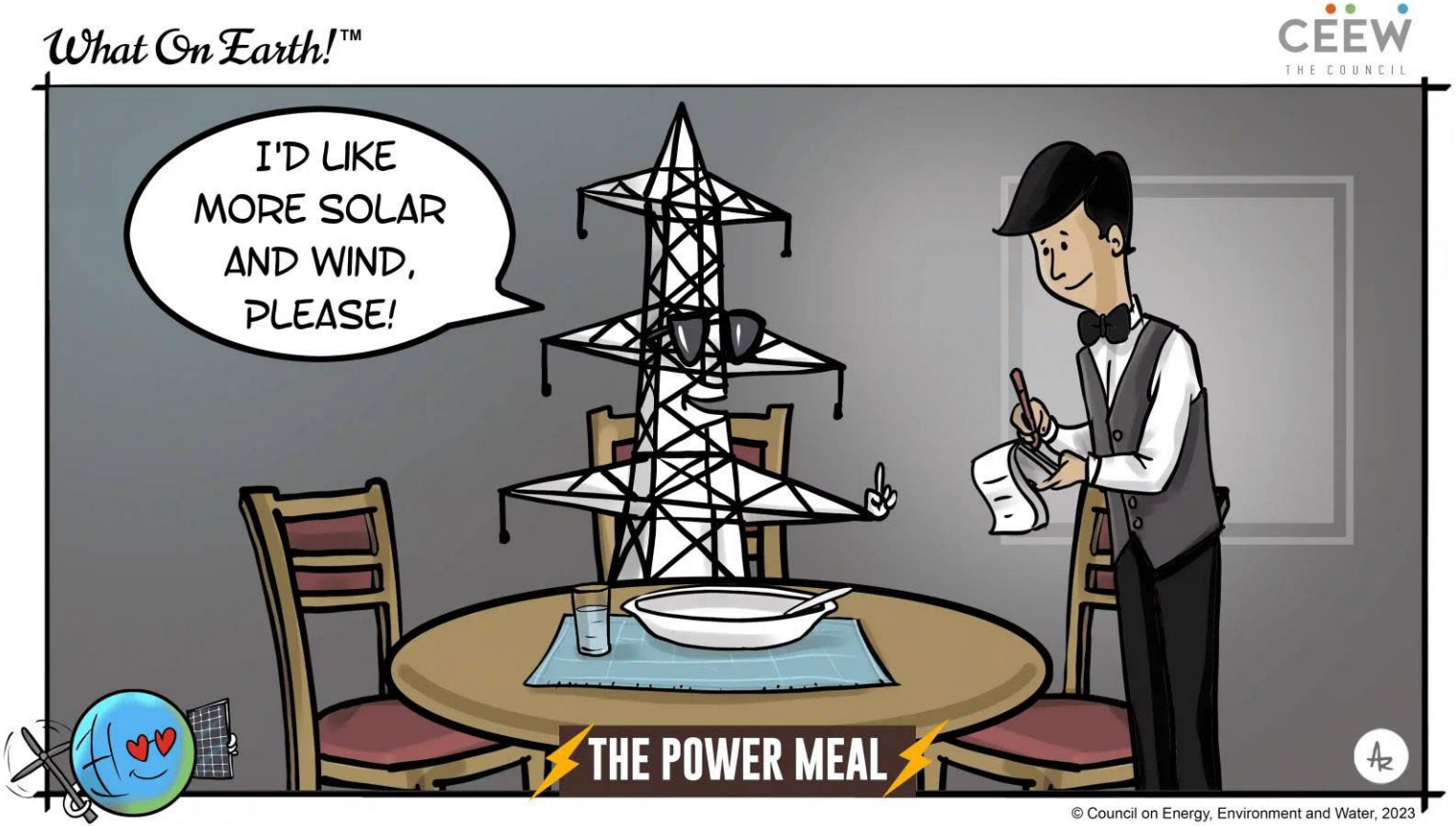
New technologies: Integrating new technologies

- Offshore wind power
  - **71 GW of offshore wind potential** in India off the coast of Gujarat and Tamil Nadu which have higher CUF factors
  - Challenges in setting up plants and laying grid infrastructure

- Green hydrogen
  - **Launched the national mission of green hydrogen**
  - Green hydrogen blending in gas pipelines
  - Target to produce 5 MMT per annum, 96 billion USD and 600 thousand jobs by 2030

PIB 2023, MNRE 2023

Thank you!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THE POWER MEAL
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