



ENERGY SECTOR

Strategies for Sunrise Andhra Pradesh



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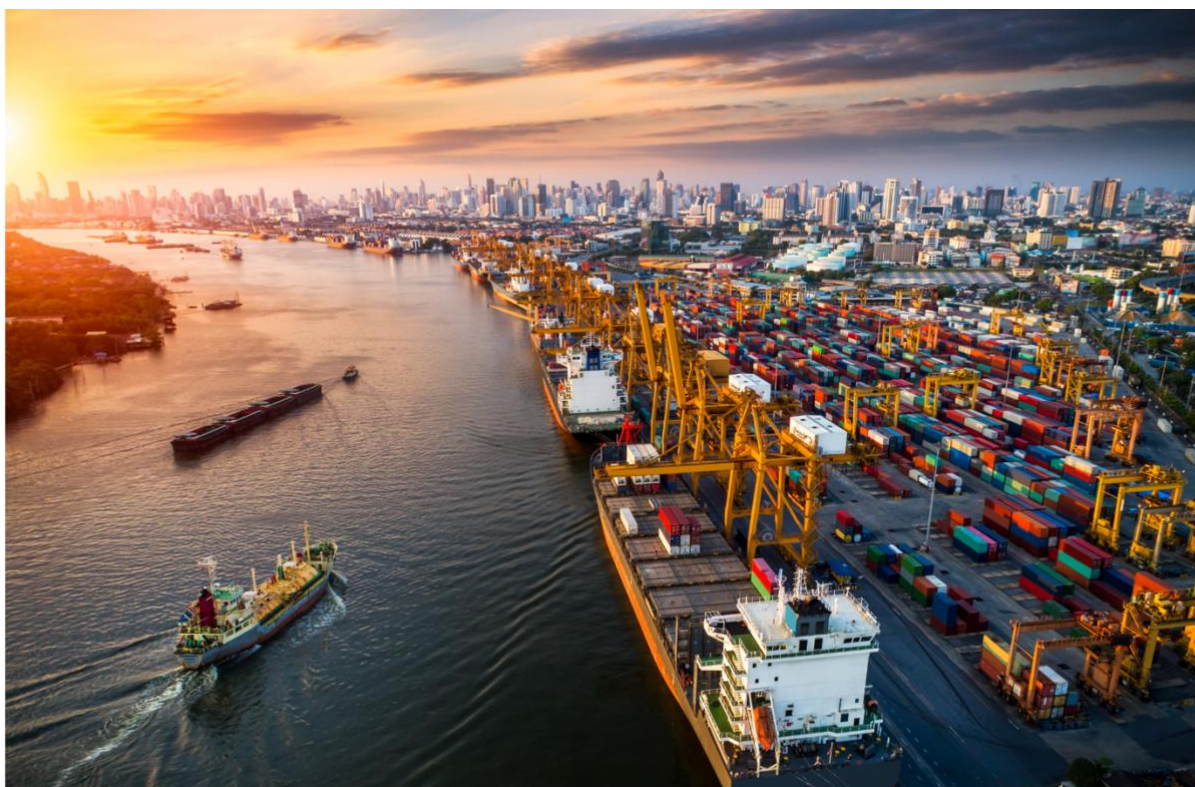
Energy in India Today - Conventional but Transforming

Energy consumption in India has more than doubled since 2000, propelled upwards by a growing population, universal household access, changing lifestyle, urbanization, a structural shift towards manufacturing, and robust economic growth. However, per capita electricity use is one-third of the global average [1] (1255 kWh in 2021–2022).

As of May 2023, fossil fuels accounted for 57% of total installed capacity at all levels in India [2]. Renewables accounted for 41%, of which 11.2% is hydro, 10.3% is wind, and 16.1% is solar. The rise of solar PV has been spectacular; the resource

policy support and technology cost reductions have quickly made it the cheapest option for new power generation. The Government of India has announced plans to add 50 GW of renewable energy capacity (10 GW per annum of wind) over five years, starting from FY 23–24, to reach the 500 GW non-fossil fuel capacity by 2030. India currently has a total renewable energy capacity of about 175 GW (as of February 28, 2023). Over the past five years, solar PV capacity has grown at an average rate of around 60%, and wind capacity has grown at around 10%, outpacing the 7% growth in overall installed capacity. India has emerged as one of the world leaders in the energy transition.

Energy sector in Andhra Pradesh

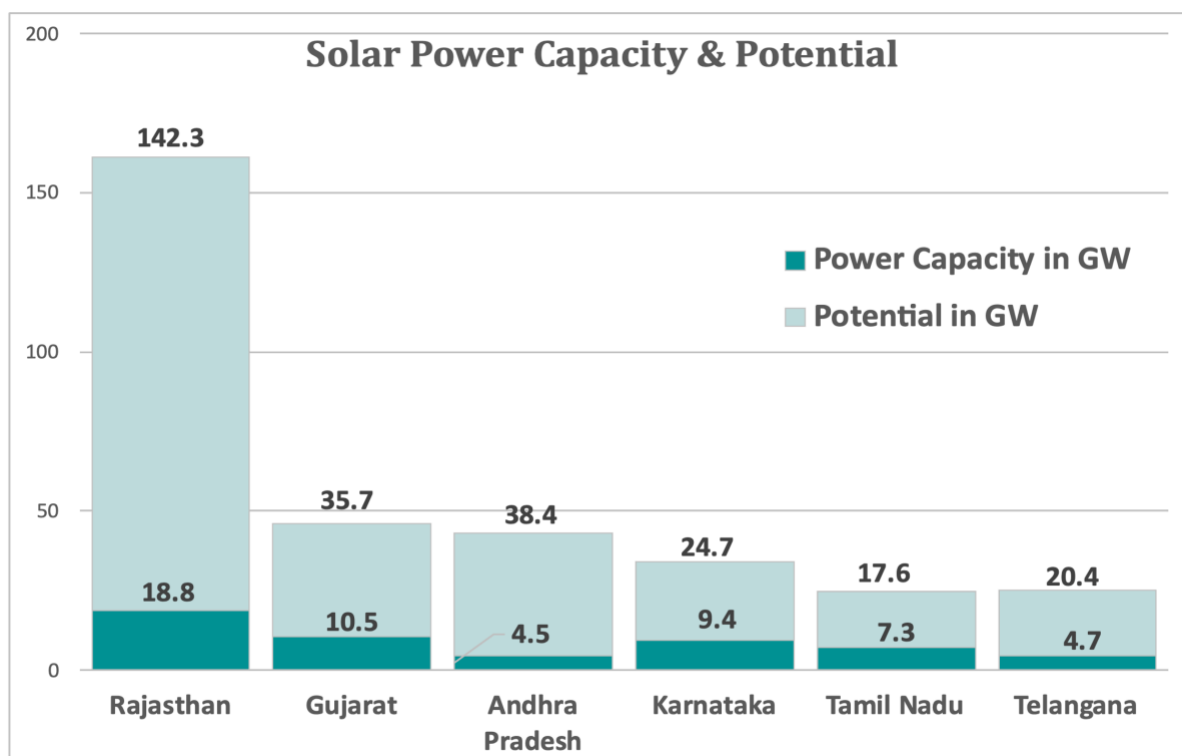
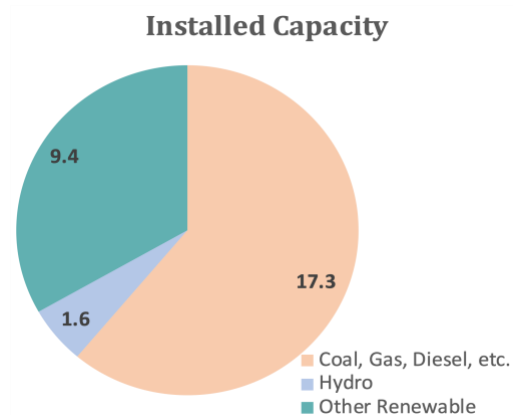


potential is huge, ambitions are high, and



As of March 2023, the total installed power generation capacity in Andhra Pradesh was 28.3 gigawatts. With the proposed economic growth rate of more than 10% per year, the installed energy capacity should increase by a CAGR of more than 8% per year. To become an energy exporter, the installed capacity growth rate must be about 10% per year. This would mean an **addition of about 3 gigawatts of capacity every year** in Andhra Pradesh. Wind and solar energy have the potential to meet this enormous target in Andhra Pradesh.

Coal, Gas, Diesel, etc.	17.3 GW
Hydro	1.6 GW
Other renewable	9.4 GW
Total	28.3 GW



Energy	Installed Capacity
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Solar Power Capacity and Potential
Wind Power Capacity and Potential

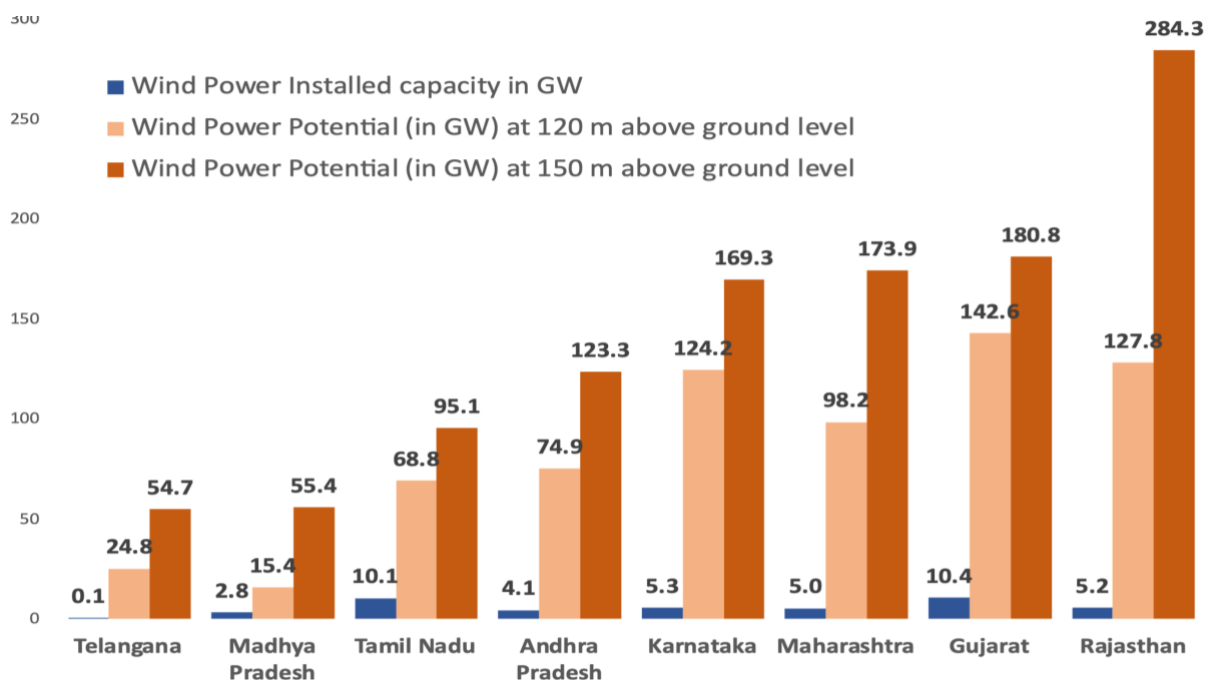


Renewable energy currently has a share of about 38% of installed capacity. The potential for solar and wind energy in Andhra Pradesh provides an opportunity for future power generation.

- **In Andhra Pradesh, wind power has a potential of about 75 gigawatts, but only about 5 gigawatts are currently exploited.**
- **Solar energy** has a potential of about 45 gigawatts, of which only 4 gigawatts is being utilised in Andhra Pradesh.
- **NREDCAP has signed 81 MoUs for investments worth 11.2 Lakh Cr in AP, which require active pursuit.**
- **The Government of India's Roof Top**

a total outlay of Rs. 75,021 crore. The scheme provides central financial assistance of 60% of system costs for 2 kW systems and 40% of additional system costs for systems between 2 and 3 kW in capacity. We will cap the CFA at 3 kW. At current benchmark prices, this will mean a Rs 30,000 subsidy for a 1 kW system, Rs 60,000 for 2 kW systems, and Rs 78,000 for 3 kW systems or higher.

- **Roof Top Solar Program for AP (10 lakh houses):** With about 5% of the land area share and about 6.5% share of the solar energy potential of India, Andhra Pradesh can proactively target about 10% of the target set for India. This will equate to about 10 lakh houses, with about Rs 7500 crore in



Solar program [4] aims to install rooftop solar systems and provide free electricity up to 300 units per month to one crore households, with

financial assistance from Gol. Government of Andhra Pradesh can plant for targets beyond the targets set



by Government of India for Andhra Pradesh.

- **Solar Pump Sets:** There are about 19 lakh agriculture pump sets in Andhra Pradesh availing of a 9-hour free power supply, resulting in an agriculture subsidy of about Rs 4400 crore per year. GoAP will launch a scheme to convert existing pump sets to solar energy pump sets, which will not only alleviate the strain on traditional power but also generate additional income for farmers who can sell their unused power back to the grid. This will reduce the burden on the exchequer towards the agriculture electrical subsidy, which should be sufficient to finance the scheme for 3 to 5 years. It is proposed that this scheme can be implemented through an externally aided project to ensure a 9-hour power supply on a 24/7 basis.

Other Proposed Reforms in the Power Sector

- **DECENTRALISATION: Local Grids; Local Production and Local Consumption;** Dedicated Policy Framework - In addition to rooftop solar, solar energy production in agriculture fields holds the potential for large-scale local production and consumption. Similarly, adding solar panels to greenhouses not only boosts commerce productivity and conserves water, but also generates power for the greenhouses, which can then share the surplus with the grid. Establishing local grids that integrate with main grids and feeders is another benefit of local

production and consumption. The available technology allows for simple remote monitoring of these local grids. Local production and consumption will also reduce the cost of energy transportation, thus improving overall efficiency. GoAP need to implement a dedicated policy framework and incentive scheme to harness this immense potential and lower energy costs. It will also lower the state subsidy bills for agriculture consumption, improving the financial health of distribution and transmission corporations.

- **Smart Grid** – The primary aim of smart grids is to improve the reliability of electricity networks and make the grid amenable to renewable energy inputs through distributed generation. Furthermore, increased efficiencies with smart grids and smart meters enable consumers to better



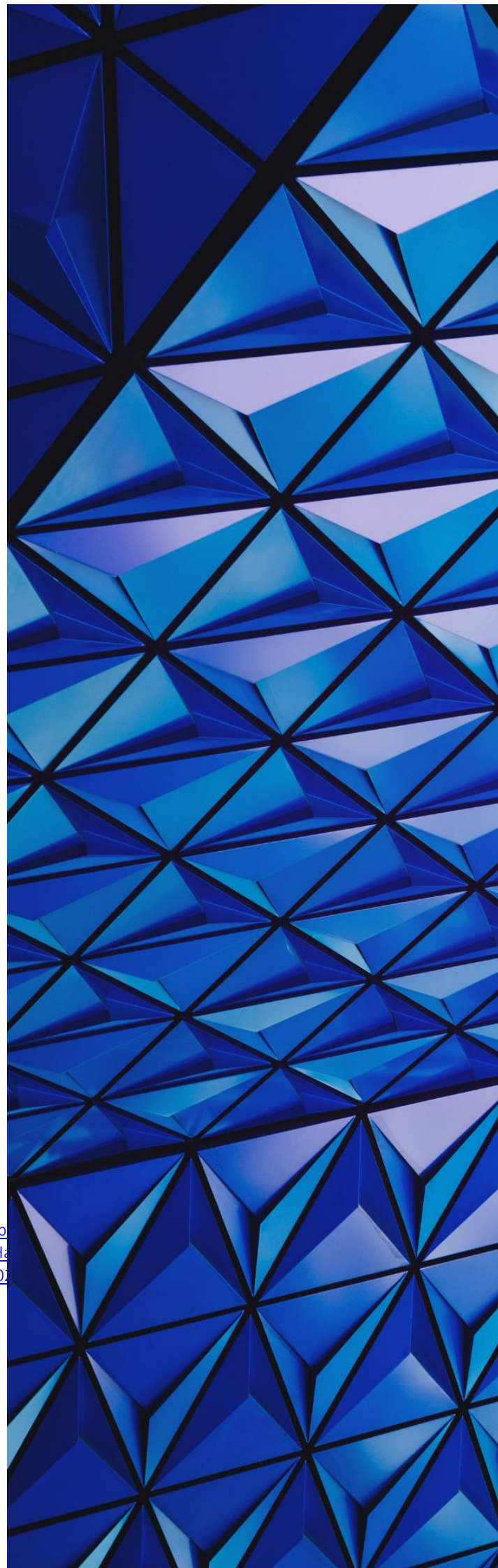
manage their electricity consumption and reduce their bills. Smart grid solutions use real-time monitoring, measurement, and control of power flows to identify losses and implement appropriate technical and managerial measures to curb them. Smart grid solutions can reduce T&D losses, peak load management, improve quality of service, increase reliability, better asset management, renewable integration, better accessibility to electricity, etc., as well as lead to self-healing grids. A dedicated program will be launched to operationalise the smart grid universally.

- **Reduction in Power Tariff:** An increased share of renewable energy, local production and consumption, the implementation of a smart grid system, and other multiple reforms in the power sector, such as the introduction of solar pump sets, have the potential to lower the cost of power for the consumer. The government has promised that it will not increase the price of power; instead, it will try to reduce the power tariff by 20 to 30% in the next 5 years. This will make the manufacturing sector competitive with multiple other sectors.

Green Hydrogen as a Renewable Alternative¹ and a Business Proposition

¹ Adopted from Niti Aayog & RMI, 2022, Harnessing Green Hydrogen- Opportunities for Deep Decarbonization in India.

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In the long run, India's distinct advantage in low-cost renewable energy generation makes green hydrogen the most competitive form of hydrogen. This allows India to potentially become one of the world's most competitive producers of green hydrogen. Green hydrogen can achieve cost parity with natural gas-based hydrogen (grey hydrogen) by 2030, if not before. Beyond cost, since hydrogen is only as clean as its source of generation, green hydrogen will be necessary to achieve a truly low-carbon economy. It will also enable the emergence of a domestically produced energy carrier that can reduce the dependence on imports for key commodities like natural gas and petroleum. **India intends to be a global hub for green hydrogen, which will be the basis of green growth through green jobs.**

By 2050, India's hydrogen demand could grow more than fourfold, accounting for almost 10% of global hydrogen demand. The initial demand growth is expected from mature markets such as refineries, ammonia, and methanol, which already use hydrogen as an industrial feedstock and in chemical processes. In the long term, steel and heavy-duty trucking are likely to drive most of the demand growth, accounting for almost 52% of total demand by 2050. Green hydrogen's share of this demand could grow from 16% in 2030 to almost 94% by 2050, based on price parity alone. This translates to an implied cumulative electrolyser capacity demand of 20 GW by 2030 and 226 GW by 2050, promising a sizeable opportunity for indigenous manufacturing of a global

emerging energy technology. The cumulative value of the green hydrogen market in India could be \$8 billion by 2030 and \$340 billion by 2050. The electrolyser market size could be approximately \$5 billion by 2030 and \$31 billion by 2050.

The Government of India, on January 4, 2023, approved the National Green Hydrogen Mission. The initial outlay for the mission will be Rs. 19,744 crore, with the following likely outcomes by 2030:

- The country should develop a green hydrogen production capacity of at least 5 MMT (million metric tonnes) per annum, along with an associated renewable energy capacity addition of about 125 GW.
- Over Rs. 8 lakh crore in total investments
- Over 6 lakh jobs have been created.
- The cumulative reduction in fossil fuel imports has exceeded Rs. 1 lakh crore.
- Abatement of nearly 50 MMT of annual greenhouse gas emissions

The mission will facilitate demand creation, production, utilization, and export of green hydrogen. Under the Strategic Interventions for Green Hydrogen Transition Programme (SIGHT), two distinct financial incentive mechanisms—targeting domestic manufacturing of electrolysers and production of green hydrogen—will be provided under the Mission. The mission will also support pilot projects in emerging end-use sectors and production pathways. Regions capable of supporting large-scale production and/or



utilisation of hydrogen will be identified and developed as green hydrogen hubs.

Andhra Pradesh's Opportunity: A New Green Hydrogen Policy - The government's green hydrogen mission provides an excellent opportunity for Andhra Pradesh to become an energy exporter by leveraging its natural endowment of proximity to the sea and vast river network.

- **Revise Policy:** In 2023, the Andhra Pradesh government issued a policy notification for green hydrogen. However, it is necessary to review and revise this policy to encourage investors to proactively take advantage of the opportunities presented by the Government of India's green hydrogen mission, particularly in the following three areas:
 1. Manufacturing of electrolyzers
 2. Production of green hydrogen
 3. Setting up green hydrogen hubs
- The following companies have entered into Memorandum of Understanding (MoU) with the government of Andhra Pradesh to invest in the green hydrogen sector. Review the current status of the modulus immediately to expedite the setup of the related units.
 - I. NTPC has entered into an MoU to set up India's largest green hydrogen production plant near Pudimadaka in the Visakhapatnam district. In two phases, the proposed total investment is 1.1 lakh crore.

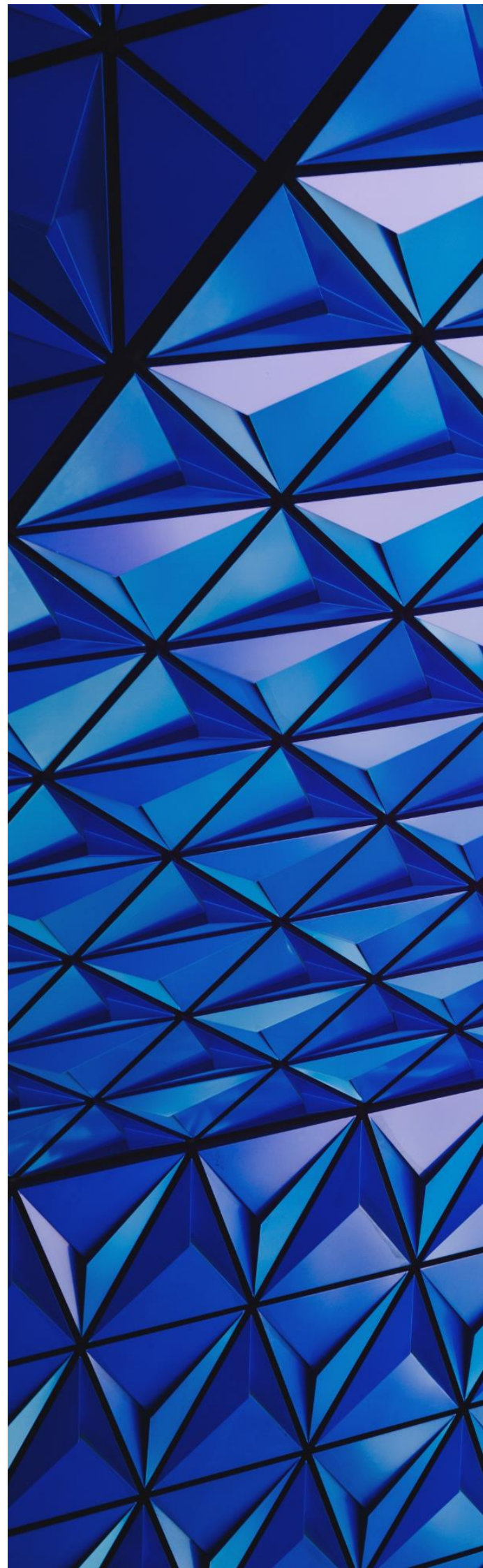
- II. Adani Green has shown interest in setting up a 15-gigawatt facility for renewable energy in Andhra Pradesh.
 - III. Greenko has proposed an investment of Rs 40,000 crore.
 - IV. ABC Ltd. has proposed an investment of 1.2 lakh crore.
- Similarly, GoAP shall invite other Indian companies in the green hydrogen field, such as Acme Cleantech, Avaada GreenH2, Bharat Petroleum Corp., CESC, Greenko ZeroC, JSW Energy, Reliance Industries, Sembcorp Green Hydrogen, and Torrent Power, to establish green hydrogen units.
 - **Companies for Electrolysers:** Additionally, companies like Adani Group, Acme Cleantech Solutions,



Advait Infratech, Bharat Heavy Electricals, Jindal India, Larsen & Toubro, Ohmium Operations, Reliance Industries, and Waaree Energies have shown interest in setting up electrolyser manufacturing units and should be proactively invited to Andhra Pradesh.

- The AP government's policy framework should offer incentives to corporations and the GoAP to establish a center of excellence for research in green hydrogen and related fields in Andhra Pradesh.
- **Start Up in Green Hydrogen and Battery:** The government will actively promote startups in green hydrogen-related technologies, cell chemistry, etc., along with other renewable energy sources like solar and wind. The startup policy will enunciate the incentives and proposals for supporting startups in the green hydrogen and other renewable energy sectors.

With multiple reforms and research, AP aims to become a net energy exporter in time while providing quality services to its consumers.





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