

adani

Growth  
With  
Goodness

Adani New Industries Limited

Green Hydrogen Ecosystem

Feb 2025

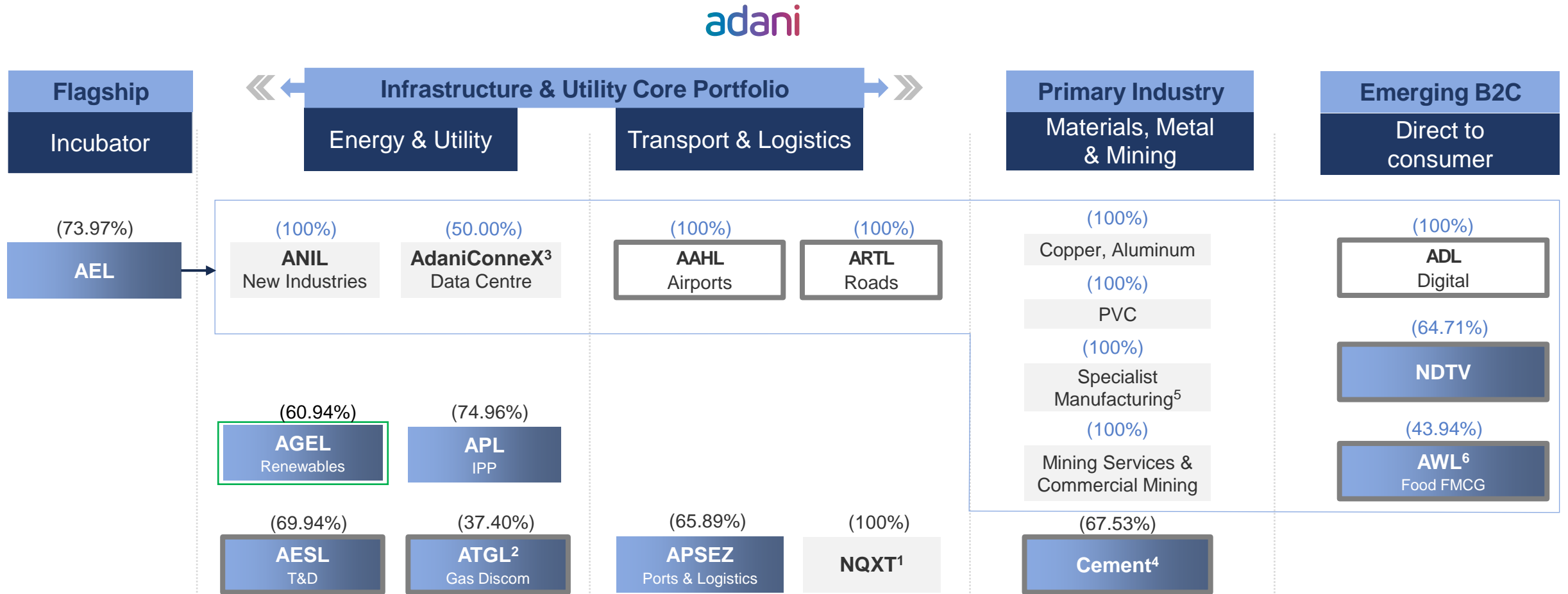




# 01

## Adani Portfolio

# Adani Portfolio: A World class infrastructure & utility portfolio

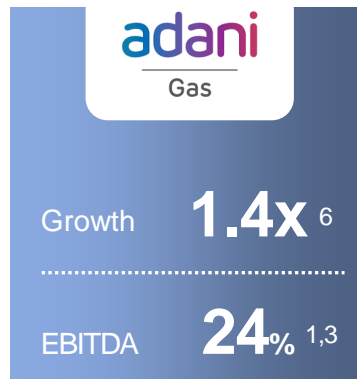
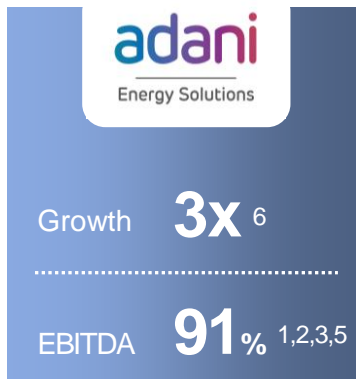
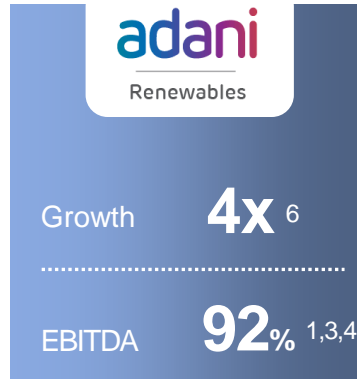
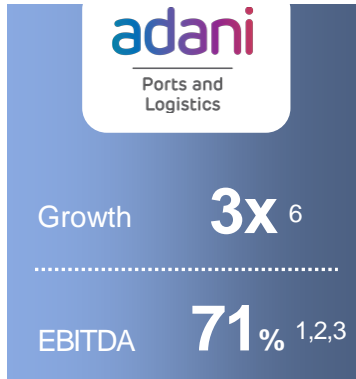


**A multi-decade story of high growth centered around infrastructure & utility core**

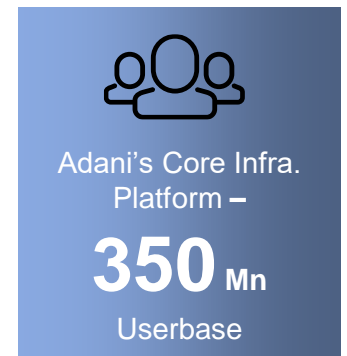
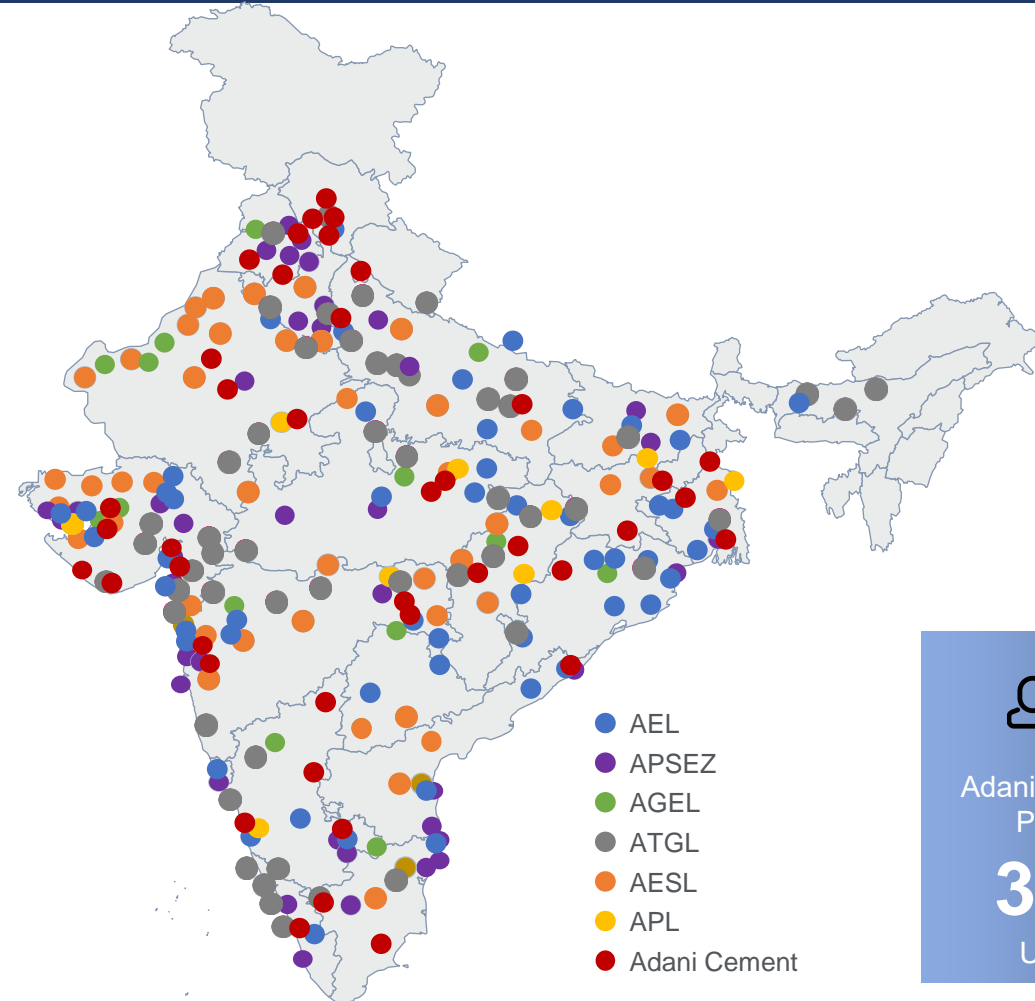
1. NQXT: North Queensland Export Terminal | 2. ATGL: Adani Total Gas Ltd, JV with Total Energies | 3. Data center, JV with EdgeConnex, | 4. Cement includes 67.53% (67.57% on Voting Rights basis) stake in Ambuja Cements as on 31<sup>st</sup> December, 2024 which in turn owns 50.05% in ACC Limited. Adani directly owns 6.64% stake in ACC Limited. Ambuja Cements Ltd. holds 58.08% stake in Sanghi Industries Ltd. | 5. Includes the manufacturing of Defense and Aerospace Equipment | 6. AEL to exit Adani Wilmar JV, diluted 13.50% through Offer For Sale (13<sup>th</sup> Jan'24), residual stake dilution is pursuant to agreement between Adani & Wilmar Group. | AEL: Adani Enterprises Limited; APSEZ: Adani Ports and Special Economic Zone Limited; AESL: Adani Energy Solutions Limited; T&D: Transmission & Distribution; APL: Adani Power Limited; AGEL: Adani Green Energy Limited; AAHL: Adani Airport Holdings Limited; ARTL: Adani Roads Transport Limited; ANIL: Adani New Industries Limited; AWL: Adani Wilmar Limited; ADL: Adani Digital Labs Pvt. Limited; IPP: Independent Power Producer | NDTV: New Delhi Television Ltd | PVC: Polyvinyl Chloride | Promoter's holdings are as on 31<sup>st</sup> December, 2024.

# Adani Portfolio: Decades long track record of industry best growth with national footprint

## Secular growth with world leading efficiency

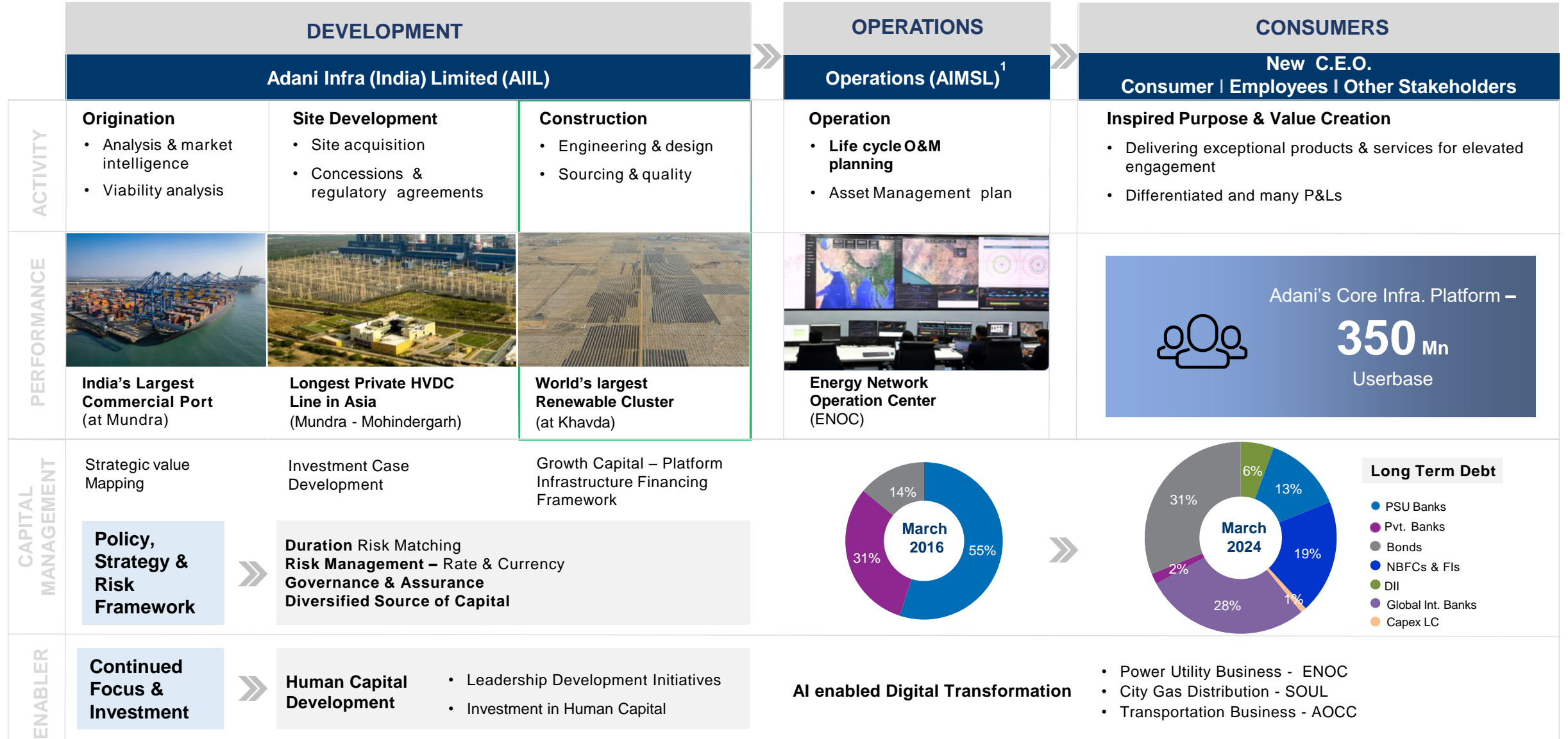


## National footprint with deep coverage



Note: 1. Data for FY24 ; 2. Margin for Indian ports business only | Excludes forex gains/losses; 3. EBITDA: Earning before Interest Tax Depreciation & Amortization | EBITDA: PAT + Share of profit from JV + Tax + Deferred Tax + Depreciation + Finance Cost + Forex Loss / (Gain) + Exceptional Items 4. EBITDA Margin represents EBITDA earned from power supply 5. Operating EBITDA margin of transmission business only, does not include distribution business | 6. Growth pertains to expansion and development aligned with market growth. Growth of respective Adani portfolio company vs. Industry growth is as follows: **APSEZ's** cargo volume surged from 113 MMT to 408 MMT (14%) between 2014 and 2024, outpacing the industry's growth from 972 MMT to 1539 MMT (5%). **AGEL's** operational capacity expanded from 0.3 GW to 10.9 GW (57%) between 2016 and 2024, surpassing the industry's growth from 46 GW to 143.6 GW (15%). **AESL's** transmission length increased from 6,950 ckm to 20,509 ckm (14%) between 2016 and 2024, surpassing the industry's growth from 3,41,551 ckm to 4,85,544 ckm (4%). **ATGL** expanded its geographical areas from 6 to 52 (27%) between 2015 and 2024, outperforming the industry's growth from 62 to 307 (19%). PBT: Profit before tax | ATGL: Adani Total Gas Limited | AEL: Adani Enterprises Limited | APSEZ: Adani Ports and Special Economic Zone Limited | AESL: Adani Energy Solutions Limited | APL: Adani Power Limited | AGEL: Adani Green Energy Limited | Growth represents the comparison with respective industry segment. Industry source: APSEZ (domestic cargo volume): <https://shipmin.gov.in/division/transport-research> | Renewable (operational capacity): [Installed Capacity Report - Central Electricity Authority \(cea.nic.in\)](https://www.cea.nic.in/) | AESL (ckms): [National Power Portal \(npp.gov.in\)](https://www.npp.gov.in/) | ATGL (GAs): [Brochure petroleum.cdr \(pngrb.gov.in\)](https://www.pngrb.gov.in/) | ckms: circuit kilometers | GA: Geographical Areas

# Adani Portfolio: Repeatable, robust & proven transformative model of investment



Note 1 Adani Environmental Resource Management Services Ltd. (additional company is being proposed)

O&M: Operations & Maintenance | HVDC: High voltage direct current | PSU: Public Sector Undertaking (Public Banks in India) | GMTN: Global Medium-Term Notes | SLB: Sustainability Linked Bonds | AEML: Adani Electricity Mumbai Ltd. | AIMSL : Adani Infra Mgt Services Pvt Ltd | IG: Investment Grade | LC: Letter of Credit | DII: Domestic Institutional Investors | COP26: 2021 United Nations Climate Change Conference | AGEL: Adani Green Energy Ltd. | NBFC: Non-Banking Financial Company | AAIL: Adani Infra (India) Ltd.

# ANIL: Emulating Adani's business philosophy



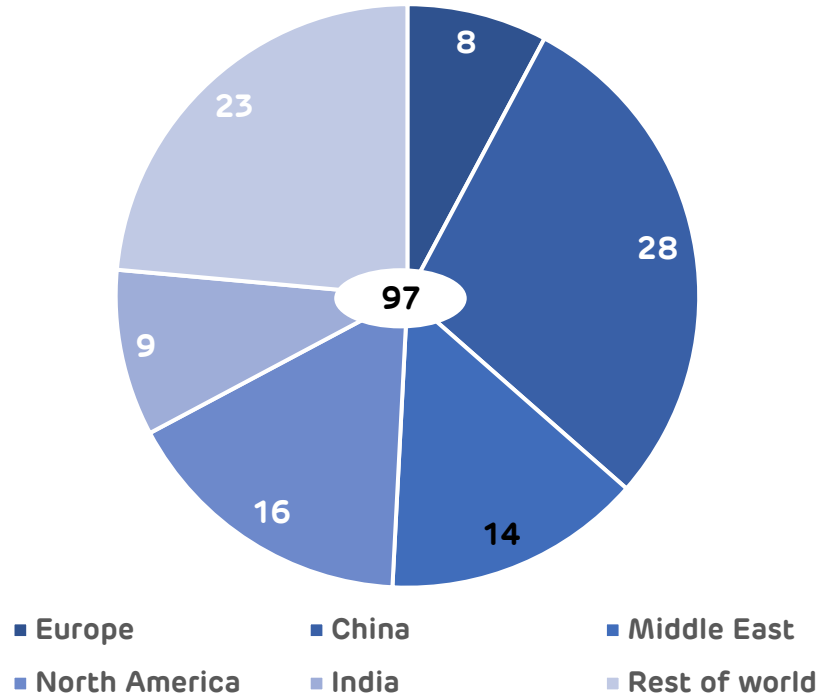


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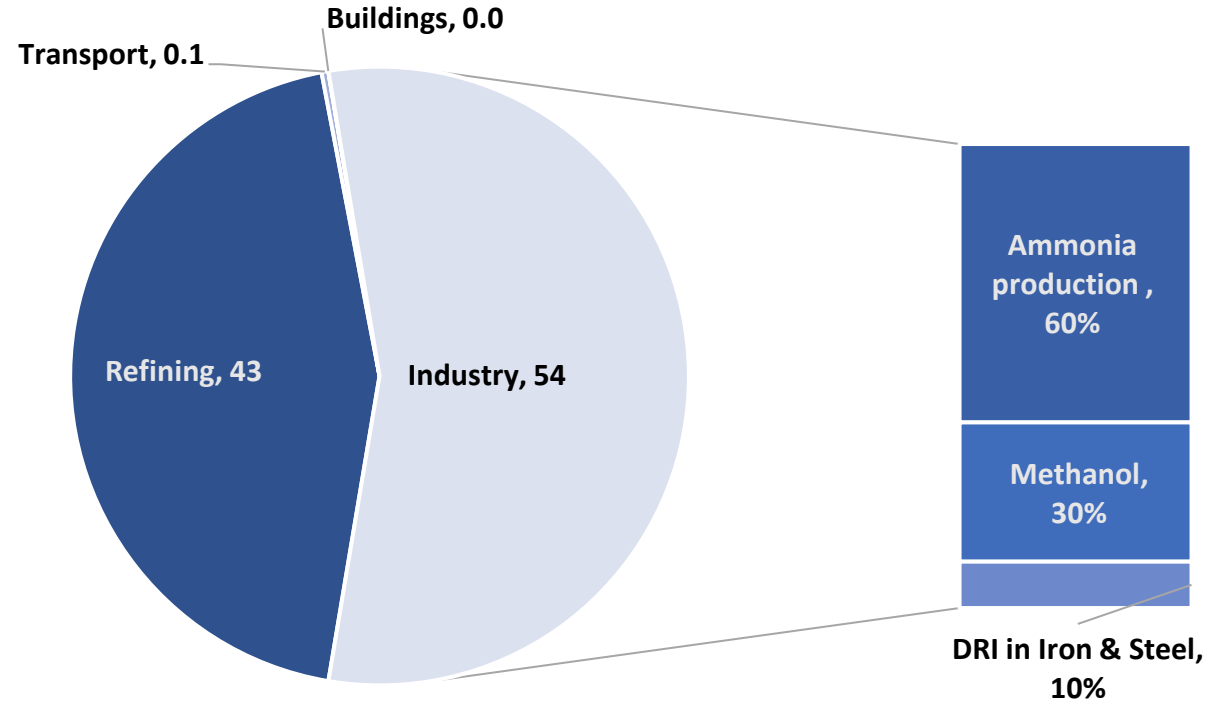
## Global hydrogen landscape

# Global Hydrogen Demand

Global demand for Hydrogen 2023 (MMTPA) by Region



Global demand for Hydrogen 2023 (MMTPA) by Sectors



- ❑ Global hydrogen use reached 97 MMTPA in 2023
- ❑ Low emissions hydrogen<sup>1</sup> production accounts for ~1 MMTPA out of which hydrogen from water electrolysis is ~ 0.185 MMTPA

**Current low penetration of Green Hydrogen signals significant potential for replacement demand & new uses**

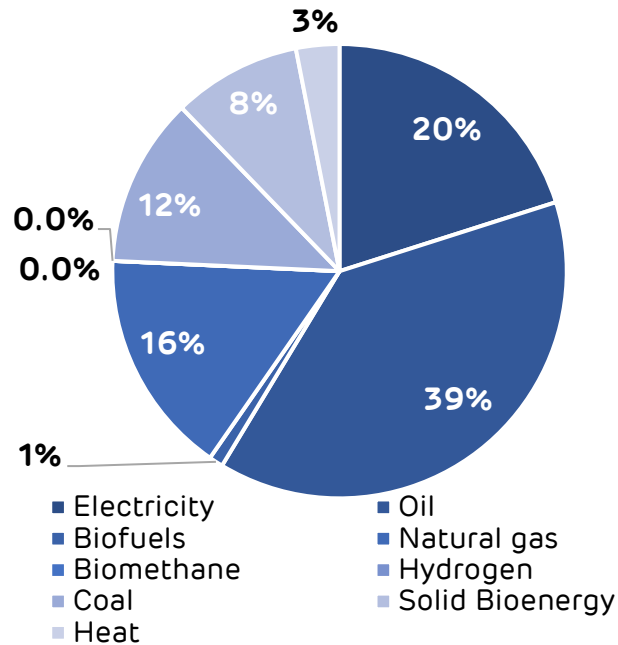
Source: World Energy Outlook 2024 (IEA); Global Hydrogen Review 2024 (IEA)

1. Low-emissions hydrogen is produced from electrolysis using electricity generated by RE or Nuclear, from Fossil Fuels with CCUS or derived from Bioenergy;

CCUS : Carbon Capture Utilization & Storage; MMTPA: Million Metric Tonnes per Annum; DRI: Direct Reduced Iron

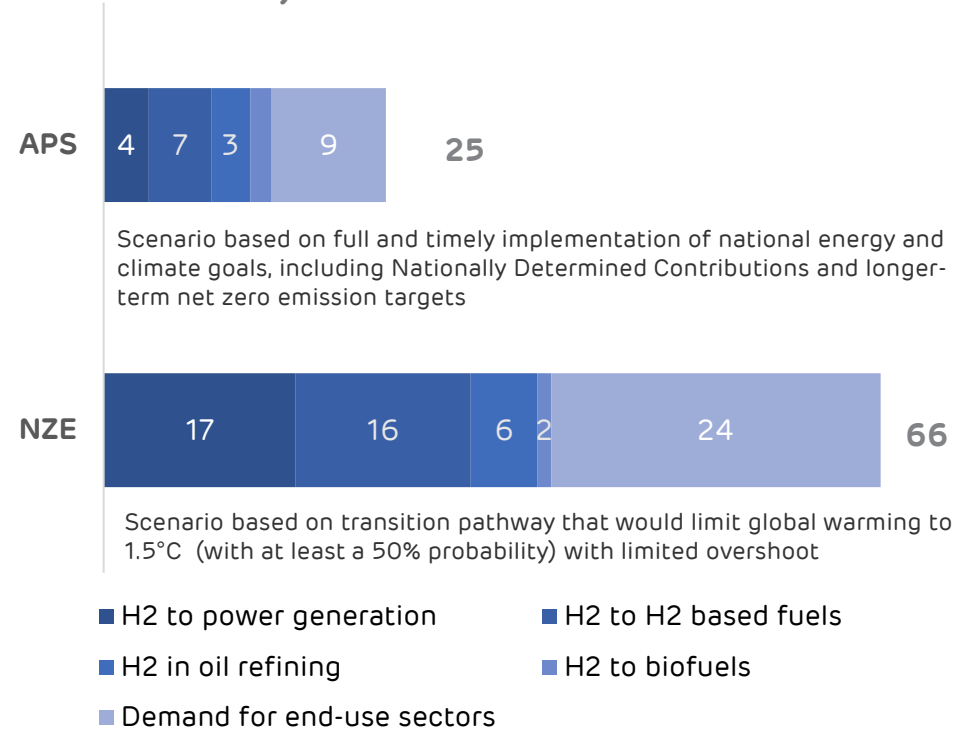
# Global Hydrogen Demand – Future Potential

World energy consumption by Sources - 2023



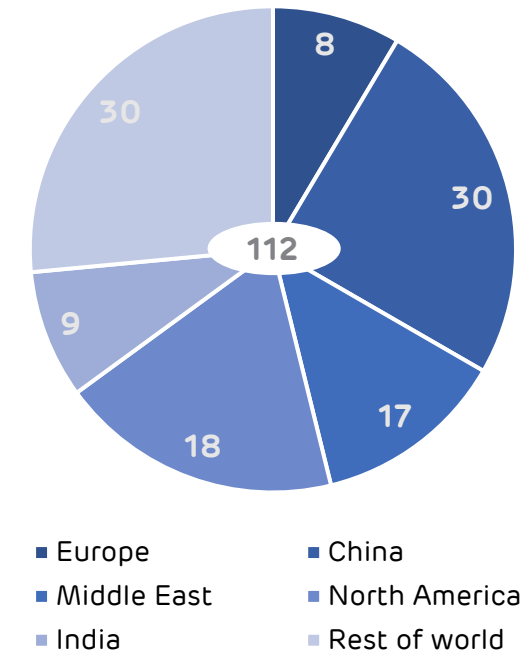
- Electrification to contribute towards reducing fossil fuel demand, leading to increased share in future from current 20%.
- Green Hydrogen to also work as source of electricity in RE resources deficient areas.

Low-emissions H<sub>2</sub> demand (MMTPA) by 2030 across scenarios



- As per APS 2030, Low-emissions H<sub>2</sub> from electrolysis using RE or Nuclear will be 18 MMTPA and to be 7 MMTPA from Fossil Fuels with CCUS or Bioenergy.
- China, Europe, Middle East and North America to lead the growth in H<sub>2</sub> demand and will account for ~ 65% of 2030 total demand

Global H<sub>2</sub> demand (MMTPA) by 2030 - APS

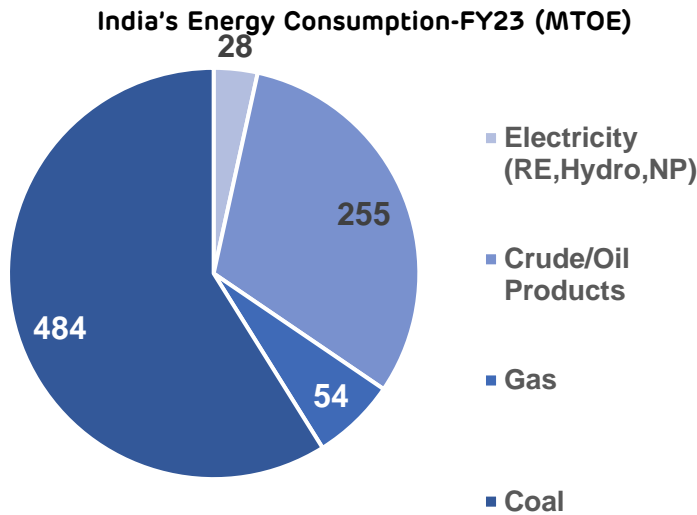


# 03

## India's green hydrogen market



# India consumes 6.55 MMTPA hydrogen (grey)



## Green H<sub>2</sub> – Moving from Greening the Grid to Greening Industry and Mobility

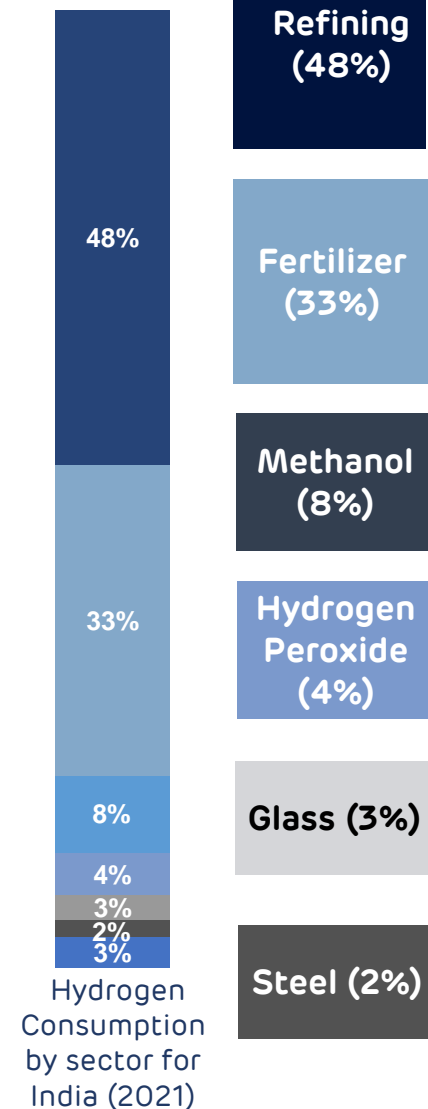
44% of Gas and ~89% of Oil imported for a net import bill of USD 144 Bn in FY23

Green H<sub>2</sub> and Derivatives can substitute use of fossil fuels in industry thus reducing import requirements

Green H<sub>2</sub> and Derivatives are also an option for hard to abate sectors such as fertilizers, steel and refineries

Source: MOSPI (Ministry of Statistics and Program Implementation) 2024 report on Energy Statistic

6.55 MMTPA



Refining (48%)

- Imported natural gas to produce H<sub>2</sub> through SMR process
- H<sub>2</sub> is used to process crude oil to obtain refined fuels e.g. gasoline, diesel. Sulphur impurities are removed via Hydro-desulfurization

Fertilizer (33%)

- H<sub>2</sub> is used to produce ammonia and ~90% of ammonia is used to manufacture fertilizers
- Natural gas (80% imported) is the main feedstock for the fertilizer production

Methanol (8%)

- Hydrogen is used in production of methanol which is further used in production of acetic acid and formaldehyde

Hydrogen Peroxide (4%)

- Hydrogen is used in the first step, i.e. hydrogenation of working solution of four-step hydrogen peroxide manufacturing process

Glass (3%)

- Hydrogen is used as a getter gas to prevent oxidation over tin baths used in float glass manufacturing process, glass formed on the baths is made without defects

Steel (2%)

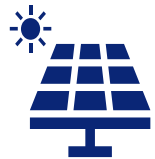
- To produce virgin metallics (DRI or HBI) from lump iron ore (or pellets) requires ~650 Nm<sup>3</sup> of hydrogen (or 58 kg) per ton of DRI

# India's green hydrogen (GH<sub>2</sub>) target & demand by 2030

## National Green Hydrogen Mission



At least  
**5 MMT GH<sub>2</sub>**  
Annual production



**125 GW RE**  
capacity for GH<sub>2</sub>  
generation &  
associated  
transmission network



**60-100 GW**  
Electrolyser capacity



**INR 8 Lakh Cr**  
Investment

## Sectoral Demand

End Use Sectors	Green H <sub>2</sub> Market (MMTPA)			Remarks
	FY26	FY30	FY35	
Refinery Demand	0.13	0.78	1.85	- Green H <sub>2</sub> consumption by existing refining capacity
Green Ammonia	-	0.52	0.78	- Substitution of Ammonia imports (~2.34 MMTPA in FY23)
CGD Demand	0.06	0.19	0.46	- Green H <sub>2</sub> blended with city gas distribution (15% blending expected)
Green Fertilizer	0.26	0.67	1.51	- India imports ~9 MMTPA (FY23) urea. Opportunity to substitute urea imports - GHCO mandates as decided by MNRE
Mobility - Methanol	0.18	1.35	8.66	- Pilots are being conducted for 15% methanol blending with diesel - ICEs being developed for H <sub>2</sub> use
Exports and Shipping fuel	0.30	3.50	8.50	- Additional demand from green shipping fuel
<b>Total</b>	<b>0.9</b>	<b>7.0</b>	<b>21.8</b>	- Capex incentive scheme for GH <sub>2</sub> pilot projects announced, for end use in Shipping, Ports, Steel, Mobility



# 04

## ANIL Strategy

# Green hydrogen: India story

## Decarbonization: "Panchamrit" strategy (COP26)

## Supportive policy environment

- 1 500 GW non-fossil energy capacity by 2030
- 2 50% of India's energy requirements from RE by 2030
- 3 Reduction in total projected carbon emissions by 1 Bn Tonnes between 2022 & 2030
- 4 Reduction in carbon intensity of the economy by 45% by 2030, over 2005 levels
- 5 Target of net zero emissions by 2070

- 1 National Green Hydrogen Mission Phase-1 launched on 17<sup>th</sup> Feb 2022
- 2 Phase 1 included supply side incentives such as ISTS charges waiver, banking, etc.
- 3 Green Hydrogen Consumption Obligations (GHCO) for end-use sectors, PLI for green hydrogen & derivatives production
- 4 Support for value chain through PLI e.g., for Solar, Electrolyser manufacturing
- 5 Other measures such as ALMM, BCD

*PLI: Production Linked Incentive | ISTS: Inter State transmission system | ALMM: Approved list of Models and Manufacturers | BCD: Basic Customs Duty*

# ANIL: One of the world's largest\* fully integrated GH<sub>2</sub> platform

## What it takes to win

### 1 Competitive cost Green Electron



- Input power cost accounts for ~60% of cost of Green Hydrogen
- Economies of scale and large resources to facilitate lowest cost electron

### 2 End-to-end supply chain and resource control



- Execution Risk mitigation by full integration of supply chain
- Tighter control on capex and resources

### 3 Integrated Green H<sub>2</sub> ecosystem



- Integrated development across the value chain – pipelines/transport options, storage facilities, port facilities and terminals



## How we are delivering it

### Large scale with high quality resources

- Investment of **USD 50 bn** in GH<sub>2</sub> ecosystem
- Secured resource rich contiguous land for RE and hydrogen production

### Mine to module manufacturing ecosystem

- All key components of GH<sub>2</sub> projects within ANIL – Solar, Wind, Electrolyzers

### Leveraging broader Adani ecosystem – RE, Transmission, Ports, Logistics, Gas

- GH<sub>2</sub> and derivatives hub at Mundra, Gujarat
- Integration into Global supply chain for hydrogen and its derivatives

Deliver the lowest cost green molecule to transform India's energy landscape

# ANIL: Segments

## Adani New Industries Limited

### Supply Chain : Manufacturing

- Manufacture key components for RE & GH2 projects
- End to End development of supply chain

Solar – Mg Silica and Polysilicon

Solar – Ingot, wafer, cell, modules

WTG

Electrolysers

Battery & Fuel cells

**End-end supply chain control**

### Green Electron Generation

- Integrated renewable (solar and wind) power plants
- Green feedstock for hydrogen electrolysers

Captive solar, wind and hybrid renewable power plants

Resource rich site for 42+ GW for Renewable Energy

Co-located to green hydrogen electrolyser

**Integrated Renewable Power Project**

### Green Hydrogen Production

- Integrated GH2 projects
- Anchor site in Gujarat near Mundra :

Large scale resource rich site for ~2.1 MMTPA GH2 production

GH2 transport through dedicated pipeline to nearest port

**High quality resources deployed at scale**

### Downstream




- Integrating GH2 with downstream products
- Leverage Mundra's experience of handling liquid cargo
- Integrate into global GH2 supply chain

Located near largest port in India providing strategic advantage

Flexibility to develop multiple downstream products near port

**Well synergized with Adani ecosystem**

# Overall manufacturing footprint

Manufacturing Businesses	Target Capacities in 1 <sup>st</sup> Phase	Key Highlights								
	<table border="0"> <tr> <td><b>Polysilicon:</b></td> <td><b>30 KTPA</b></td> </tr> <tr> <td><b>Ingot/Wafer:</b></td> <td><b>10 GW</b></td> </tr> <tr> <td><b>Cells:</b></td> <td><b>10 GW</b></td> </tr> <tr> <td><b>Modules:</b></td> <td><b>10 GW</b></td> </tr> </table>	<b>Polysilicon:</b>	<b>30 KTPA</b>	<b>Ingot/Wafer:</b>	<b>10 GW</b>	<b>Cells:</b>	<b>10 GW</b>	<b>Modules:</b>	<b>10 GW</b>	<ul style="list-style-type: none"> <li>– Existing 4 GW of cell and module manufacturing facility;</li> <li>– More than 7+ years of experience in cell and module manufacturing</li> <li>– <b>Full backward integration starting from silicon till modules</b></li> </ul>
<b>Polysilicon:</b>	<b>30 KTPA</b>									
<b>Ingot/Wafer:</b>	<b>10 GW</b>									
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	<table border="0"> <tr> <td><b>WTG:</b></td> <td><b>5 GW</b></td> </tr> </table>	<b>WTG:</b>	<b>5 GW</b>	<ul style="list-style-type: none"> <li>– <b>5.2 MW WTG in commercial production</b>, certified for global deployment</li> <li>– <b>Manufacturing of Turbine, Nacelle &amp; Rotor Blades</b></li> <li>– Technology partnership with well known global player (W2E &amp; Windnovation)</li> </ul>						
<b>WTG:</b>	<b>5 GW</b>									
	<table border="0"> <tr> <td><b>Electrolyzer:</b></td> <td><b>5 GW</b></td> </tr> </table>	<b>Electrolyzer:</b>	<b>5 GW</b>	<ul style="list-style-type: none"> <li>– <b>Backward integration for supply assurance and cost efficiency</b></li> <li>– <b>300 MW</b> manufacturing capacity awarded under PLI Tranche 1</li> <li>– Focus on reduction in stack &amp; BOP cost through indigenization and scale</li> <li>– Manufacturing will cover multiple technologies such as Alkaline, AEM and others</li> </ul>						
<b>Electrolyzer:</b>	<b>5 GW</b>									

# Electrolyzer development status



## Technology development

Multiple tie-ups with Electrolyzer technology providers namely **Cavendish Renewable Technology (Australia)** and **Hydep (Italy)**

**Alkaline**

5 MW size Electrolyzer Pilot in progress

**AEM**

Prototype stage in progress

**C-Cell**

Prototype stage in progress



## Preferred Technology

- Alkaline**
- Proven technology for 100 years.
  - Lower initial CAPEX
- Anion Exchange Membrane (AEM)**
- High operational flexibility
  - Lower CAPEX compared to PEM
  - Better efficiency than Alkaline

## Product development

- Established **Electrolyzer Testing Lab** to drive performance improvement
- Won 300 MW Capacity under PLI scheme
- Establishing **Electrolyzer Manufacturing Facility**
- **Supply chain development for achieving 90% indigenization of Electrolyzer**

## Green Hydrogen Project: Great Rann of Kutch (GRK), Gujarat



~85,000 hectares land allotted

### Studies Completed

- Site Survey- Land profile and Topography
- Soil and Seismic condition
- Feasibility study
- Pipeline & Storage
- Power evacuation system
- Basic Engineering
- Rainfall and Drainage pattern
- Off grid integration

### On-going Studies

- Corrosion Study
- RE resource assessment
- Process study

### ANIL to leverage Group expertise

- Expertise in Giga-Scale RE Project development – **Largest RE developer in India**
- Expertise in setting up long distance transmission lines – **Largest transmission system developer in India**
- Expertise in developing and handling large ports and associated infrastructure – **Largest port operator in India**

05

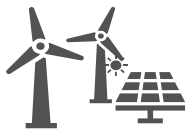
**ANIL: Green Hydrogen Generation**



# ANIL: Green Hydrogen Ecosystem for First phase of 1.0 MMTPA GH<sub>2</sub> by 2030

## Key components:

### Hybrid RE Generation



- ~21 GW+ Renewable Energy

### Electrolyser for Green H<sub>2</sub> production



- Up to ~17.5 GW Electrolyser capacity

### Green H<sub>2</sub> Compression



- 1 MMTPA Green Hydrogen (H<sub>2</sub>) compression

### H<sub>2</sub> Pipeline



- ~215 Km pipeline

### Green Ammonia



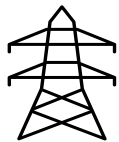
- ~5.6 MMTPA Green Ammonia capacity or equivalent derivatives
- Air separation Unit (ASU) for Nitrogen generation

### Offtake of Derivatives<sup>1</sup>



- Development of derivative transport infrastructure at Mundra port
- Export to Europe, Singapore, Japan and Korea
- Domestic demand

### Transmission Line



- Grid connected

Note:-Timelines of Project execution and commissioning to be aligned with market dynamics  
Ecosystem Optionality includes Urea, methanol, LH<sub>2</sub>, SAF, and others based on offtake requiremGH<sub>2</sub> : Green Hydrogen

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Thank You

