adani

ANIL: Green Hydrogen Ecosystem

Investor Field Tour to Mundra organized by CLSA

Nov 2022

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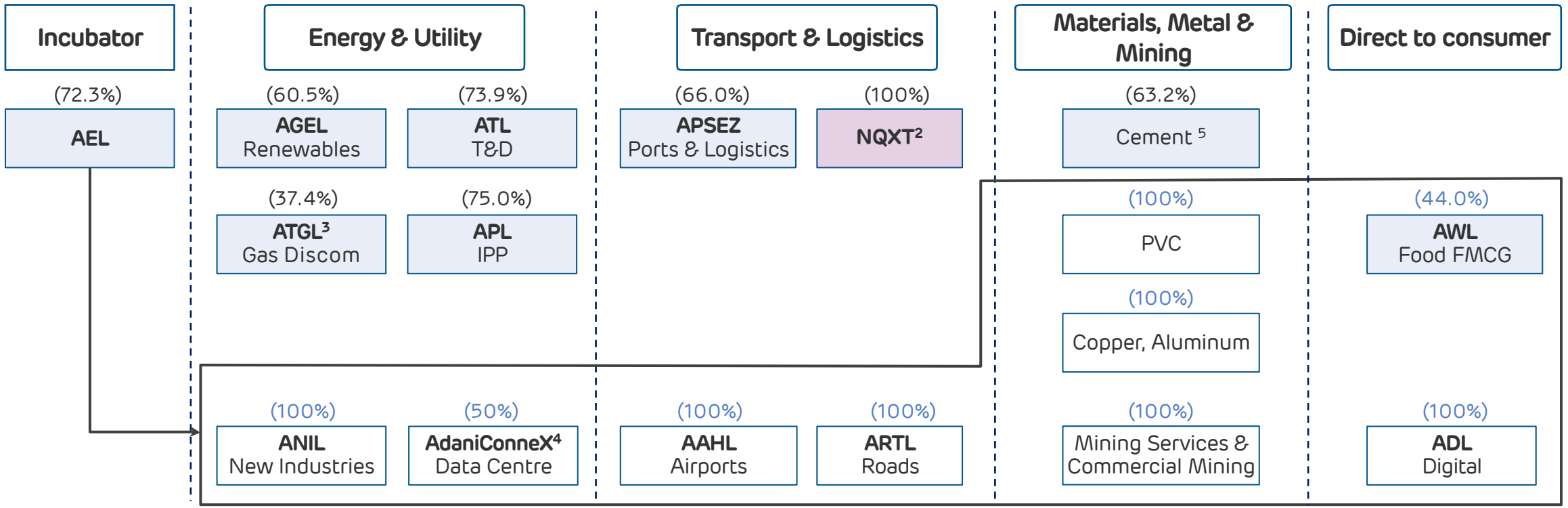
Adani Portfolio Overview

Adani: A World Class Infrastructure & Utility Portfolio

adani ~USD 240 bn[1] Combined Market Cap



(%): Promoter equity stake in Adani Portfolio companies (%): AEL equity stake in its subsidiaries

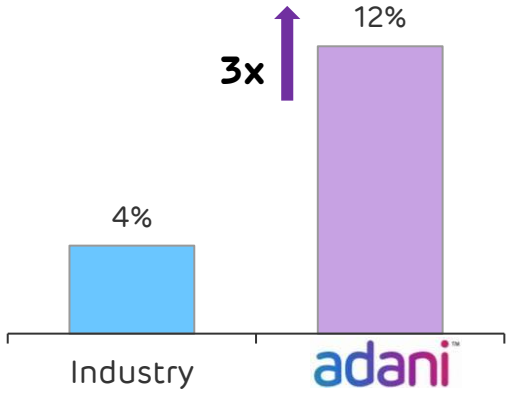
- Represents public traded listed verticals

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

1. Combined market cap of all listed entities as on Sep 30, 2022, USD/INR – 81.55 | 2. **NQXT**: North Queensland Export Terminal | 3. **ATGL**: Adani Total Gas Ltd, JV with Total Energies | 4. Data center, JV with EdgeConnex, **AEL**: Adani Enterprises Limited; **APSEZ**: Adani Ports and Special Economic Zone Limited; **ATL**: Adani Transmission 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 Limited; **IPP**: Independent Power Producer
5. Cement business includes 63.15% stake in Ambuja Cement which in turn owns 50.05% in ACC Limited. Adani directly owns 6.64% stake in ACC Limited. Ambuja and ACC together have a capacity of 66 MTPA, which makes it the second largest cement manufacturer in India.

Adani Portfolio: Decades long track record of industry best growth rates across sectors

Port Cargo Throughput (MMT)

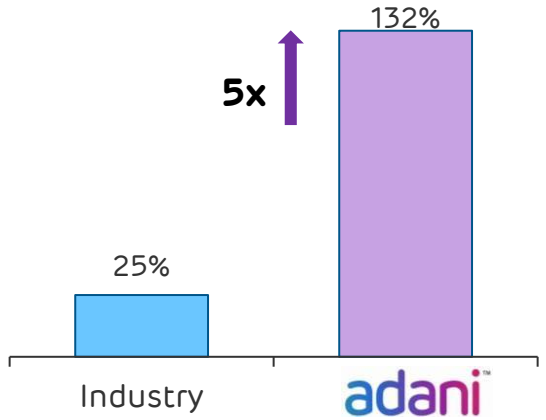


2014	972 MMT	113 MMT
2022	1,320 MMT	312 MMT

APSEZ

Highest Margin among Peers globally
EBITDA margin: 70%[1,2]
Next best peer margin: 55%

Renewable Capacity (GW)

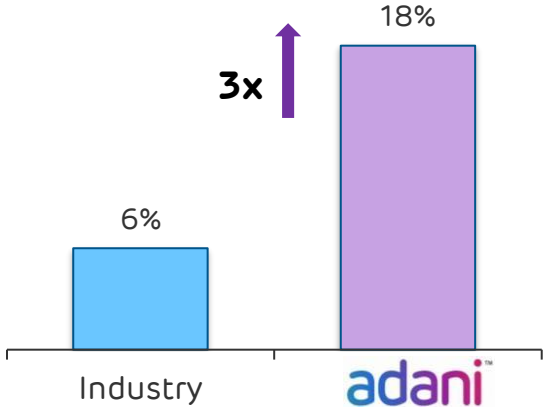


2016	46 GW	0.3 GW
2022	150 GW[9]	20.4 GW[6]

AGEL

Worlds largest developer
EBITDA margin: 92%[1,4]
Among the best in Industry

Transmission Network (ckm)

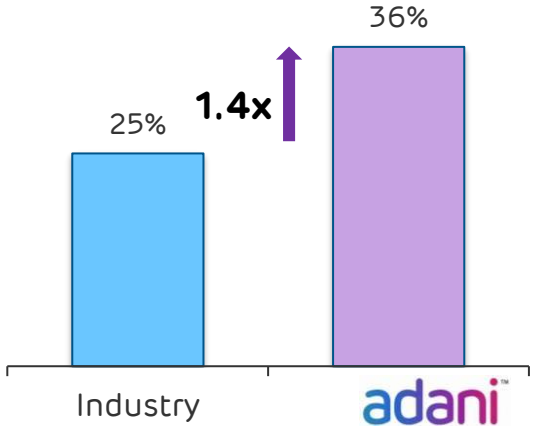


2016	320,000 ckm	6,950 ckm
2022	456,716 ckm	18,795 ckm

ATL

Highest availability among Peers
EBITDA margin: 92%[1,3,5]
Next best peer margin: 89%

CGD[7] (GAs[8] covered)



2015	62 GAs	6 GAs
2022	293 GAs	52 GAs

ATGL

India's Largest private CGD business
EBITDA margin: 41%[10]
Among the best in industry

Transformative model driving scale, growth and free cashflow

Note: 1. Data for FY22; 2. Margin for ports business only, Excludes forex gains/losses; 3. EBITDA = PBT + Depreciation + Net Finance Costs – Other Income; 4. EBITDA Margin represents EBITDA earned from power supply 5. Operating EBITDA margin of transmission business only, does not include distribution business. 6. Contracted & awarded capacity 7. CGD: City Gas distribution 8. GAs - Geographical Areas - Including JV | Industry data is from market intelligence 9. This includes 17GW of renewable capacity where PPA has been signed and the capacity is under various stages of implementation and 29GW of capacity where PPA is yet to be signed' 10. Data for FY21

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

Phase	Development		Operations		Post Operations

Activity

Origination	Site Development	Construction	Operation	Capital Mgmt
• Analysis & market intelligence • Viability analysis • **Strategic value**	• Site acquisition • Concessions & regulatory agreements • **Investment case development**	• Engineering & design • Sourcing & quality levels • **Equity & debt funding at project**	• **Life cycle O&M planning** • Asset Management plan	• Redesigning **capital structure** of assets • **Operational phase funding consistent with asset life**

Performance

India's Largest Commercial Port (at Mundra)

Highest Margin among Peers

Longest Private HVDC Line in Asia (Mundra - Mohindergarh)

Highest line availability

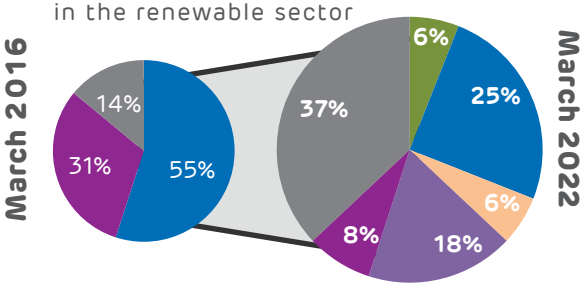
648 MW Ultra Mega Solar Power Plant (at Kamuthi, Tamil Nadu)

Constructed and Commissioned in nine months

Energy Network Operation Center (ENOC)

Centralized continuous monitoring of plants across India on a single cloud based platform

- First ever GMTN of USD 2 bn by an energy utility player in India - an SLB in line with COP26 goals - at AEML
- AGEL's tied up "Diversified Growth Capital" with revolving facility of USD 1.35 bn - will fully fund its entire project pipeline
- Issuance of 20- & 10-years dual tranche bond of USD 750 mn - APSEZ the only infrastructure company to do so
- Green bond issuance of USD 750 mn establishes AGEL as India's leading credit in the renewable sector



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. **IG**: Investment Grade, **LC**: Letter of Credit, **DII**: Domestic Institutional Investors, **COP26**: 2021 United Nations Climate Change Conference; **AGEL**: Adani Green Energy Ltd.

ANIL: Emulating Adani's Business Philosophy

	Large Integrated Platform	**De-risking Capex**	**Strategic Location**
Development	Platform uniquely positioned to offer scale and high efficiencies **Integrated platform -> Lowest cost of energy -> Lowest cost for all products in value chain**	**Next generation technologies to stay ahead of the curve** Integrated Manufacturing Partnership with industry leading technology partners	**Mundra SEZ: Integrated Green H_2 Hub** Land availability, supporting infrastructure, large existing industry cluster **Khavda: Green H_2 Generation Hub**
	Energy Infrastructure Expertise	**Adopting Global Standards**	**Technology enabled Operations**
Operations	Adani **expertise in building and operating energy infrastructure assets** across entire value chain	Adopting Global Green Hydrogen standard making it **ready to export** **Globally accepted Highest manufacturing quality standards**	**ENOC** Analytics driven O&M with AI based technology to maximize generation and perform predictive maintenance
	Regulatory Framework	**Efficient Capital Management**	**Sustainability Focus**
Value Creation	National Green Hydrogen Mission launched Several **production linked and capex linked incentives** for Green H_2 ecosystem	**Capital management plan** in line with underlying business philosophy **Diversification of funding sources**	**Several environmental and social activities undertaken at Mundra**: Water conservation, afforestation, community, health and education infrastructure for local communities

H_2: Hydrogen; **RE**: Renewable Energy; **GW**: Gigawatt; **ENOC**: Energy Network Operation Centre; **AI**: Artificial Intelligence; **O&M**: Operation & Maintenance; **SEZ**: Special Economic Zone

02

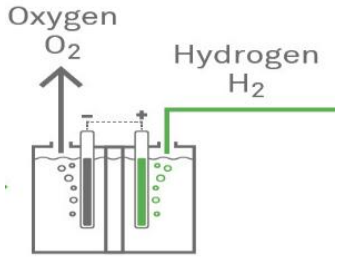
ANIL Introduction and Overview

Introduction to Green Hydrogen (GH2)

Green H2 is made from electrolysis of water using RE and can substitute fossil fuel in the form of H2 or derivatives such as Ammonia, Methanol, etc.

Renewable Energy

Green H2 plant



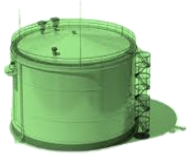
(58 Kwh/Kg-H2)

Manufacturing ecosystem

Green H2 & Derivatives

Hydrogen

Ammonia (NH_3) Synthesis
(0.18 t-H_2/ t-NH_3)



Methanol (CH_3OH) Synthesis
(0.18 t-H_2/ t-CH_3OH)

Others

Green H2 Applications

	Green H2 Form
Mobility – Fuel Cells (**H_2 as fuel**: Tracks & Buses)	H_2
City Gas Distribution (Up to **15% H_2 blending** in CGD)	H_2
Refinery (Hydrocracking, Desulphurization)	H_2
Green Fertilizers (Urea, DAP)	NH_3
Diesel Blending (Methanol Blending)	CH_3OH
Green Steel (Iron ore reduction)	H_2
Marine Fuel (Ammonia, Methanol)	NH_3 & CH_3OH
Industries (Chemical Feedstock)	**Application Dependent**

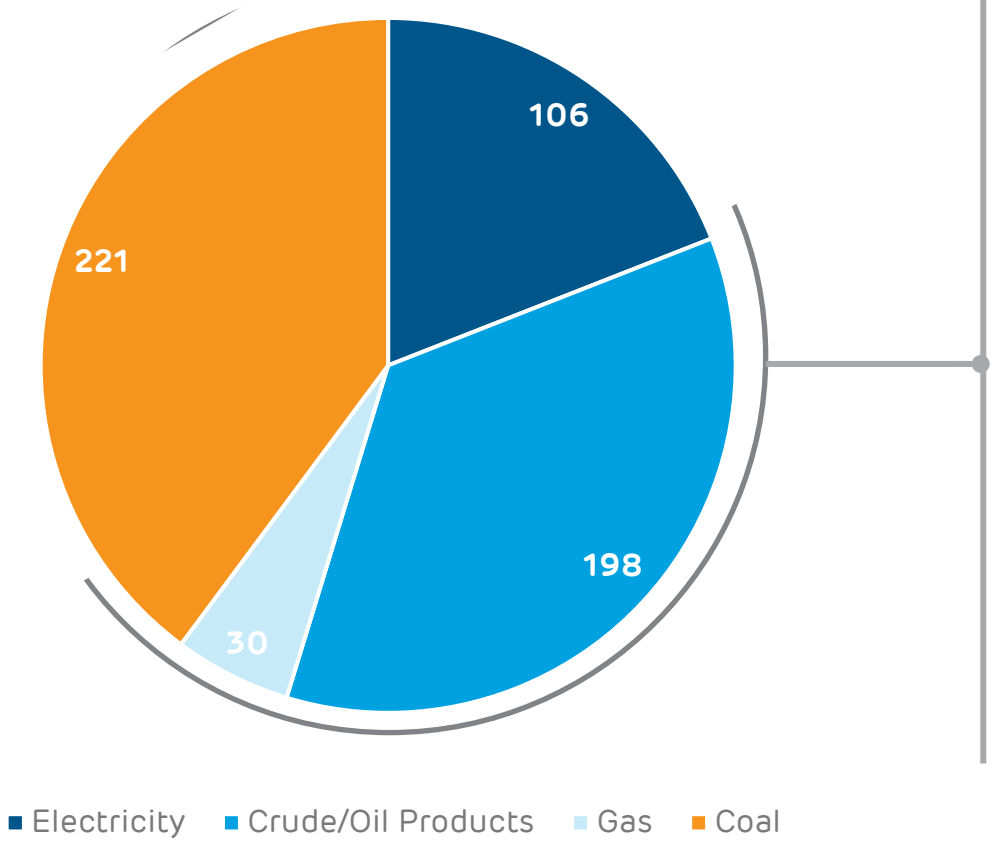
Key

20 GW RE generates **1 Mtpa H2** generates **5.6 Mtpa Ammonia** OR **10 Mtpa Urea** OR **5.3 Mtpa Methanol**

Why Green Hydrogen – India Story

MtOe

India's Final Energy Consumption



Green H2 – Moving from Greening the Grid to Greening Industry and Mobility

~53% of Gas and ~85% of Oil imported for a net import bill of USD 113 Bn in FY22

Green H2 and derivatives can substitute use of fossil fuels in industry thus reducing import requirements

Green H2 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) report on Energy Statistic – FY21 (P)

MTOE: Million Tonnes of Oil Equivalent; 1 MTOE is equivalent to 0.35 Million tonnes of Hydrogen on Lower Heating Value (LHV) basis | **RE:** Renewable Energy

Why Green Hydrogen – India Story

Decarbonization: "Panchamrit" strategy (COP26)

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 Tons 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

Supportive policy environment

1. National Green Hydrogen Mission Phase-1 launched on 17th Feb 2022
2. Phase 1 included supply side incentives such as ISTS charges waiver, banking
3. Green Hydrogen Consumption Obligations (GHCO) for end-use sectors
4. Support for value chain through PLI e.g., for Solar and possibly electrolyzers
5. Other measures such as ALMM, BCD

MTOE: Million Tonnes of Oil Equivalent; 1 MTOE is equivalent to 0.35 Million tonnes of Hydrogen on Lower Heating Value (LHV) basis | **RE:** Renewable Energy

Green Hydrogen – Massive potential to decarbonize industries

End Use Sectors	Green Hydrogen Market (MMT)			Remarks
	FY26	FY30	FY35	
Refinery Demand	0.13	0.78	1.85	– Green H_2 consumption by existing refining capacity in line with expected policy from GoI (National Hydrogen Energy mission) – New Refinery projects will further add to demand.
Green Ammonia	-	0.52	0.78	– Substitution of Ammonia imports (~2.6 MMTPA in FY20)
CGD Demand	0.06	0.19	0.46	– Green H_2 blended with city gas distribution (15% blending expected in line with National Hydrogen Energy mission)
Green Fertilizer	0.26	0.67	1.51	– India imports ~10 MT urea. Opportunity to substitute urea imports – GHCO mandates as decided by MNRE
Mobility - Methanol	0.18	1.35	8.66	– Green methanol production which can be blended with diesel for lower emissions – Pilots are being conducted for 15% methanol blending with diesel
Exports and Shipping fuel	0.30	2.50	8.50	– Forecast in line with MNRE projections, additional demand from green shipping fuel; Global H2 demand of 142 MMTPA in 2030 and 662 MMTPA in 2050
Total	**0.9**	**6.0**	**21.8**	

GHCO: Green Hydrogen Consumption Obligation; **CGD**: City Gas Distribution; **MMT**: Million Metric Tons; **MT**: Metric Tons; **MNRE**: Ministry of New & Renewable Energy; **H_2**: Hydrogen; **GoI**: Government of India

About Adani New Industries Limited (ANIL): Designed to win in the Green H2 market

What it takes to win

1 Lowest cost Green Electron

- Input power cost accounts for ~70% of cost of Green Hydrogen
- Economies of scale to facilitate lowest per unit cost infrastructure such as pipelines

2 End-to-end supply chain and resource control

- Execution Risk mitigated by full integration of supply chain
- Tighter control on cost and resources

3 Integrated Green H2 ecosystem

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

adani New Industries

How we are delivering it

Large scale with high quality resources

- Investment of **USD 50 bn** by 2030 in Green H_2 ecosystem
- 20 GW+ high quality co-located wind and solar at first location in Gujarat, near Mundra

Mine to module manufacturing ecosystem

- All key components of Green H2 projects within ANIL – Solar, wind, elecrtolyzers
- More than 85% of value of modules within Mundra ecosystem

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

- Green H_2 consumption and industrial hub at Mundra, Gujarat
- Plug and play infrastructure at Mundra along with potential off-takers

Decarbonize and deliver the lowest cost green molecule to transform India's energy landscape

USD: INR 75
H_2: Hydrogen; **MMTPA**: Million Metric Tons Per Annum

ANIL: Structure Business Segments

Supply Chain Products Manufacturing

- Manufacture key components and materials for RE projects
- Independent P&L for each manufacturing entity.

Under construction

- Solar – MG and Polysilicon
- Solar – Ingot, wafer, cell, modules
- WTG
- Electrolysers
- Battery & Fuel cells

Green Hydrogen Generation

Integrated RE and H_2 Electrolyser Projects

- RE generation to power H_2 electrolyser
- Part of H_2 will go into downstream products
- Anchor site in Gujarat near Mundra; 1-2 additional Indian sites

Downstream Products

Large scale downstream projects

- Focus on Ammonia, urea, methanol / ethanol
- Largely established technology / projects
- Carbon capture as an enabler
- Storage of Hydrogen

End-end supply chain control

High quality resources deployed at scale

Well integrated with Adani ecosystem

1. Adani Enterprises Ltd (AEL) and Total Energies of France have entered into a binding arrangement for partnership to jointly create the world's largest green hydrogen ecosystem.

Manufacturing footprint: Focus on key inputs to the Hydrogen value chain

Manufacturing Businesses	Capacities by 2025	Key Highlights
Solar Modules	MG Silica: 35 KTPA Poly: 30 KTPA Ingot/Wafer: 10 GW Cells: 10 GW Modules: 10 GW	– Existing 2 GW of cell and module manufacturing facility; Additionally upgrading 1.5 GW to 2 GW TOPCon – More than 5+ years of experience in cell and module manufacturing – **Full backward integration starting from silicon till modules**
WTG	WTG Mfg.: 3 GW	– **Prototype deployed** – **Manufacturing Turbine, Nacelle & Rotor Blades** – Technology partnership with well known global player
Electrolyser	Electrolyser Mfg.: 5 GW	– **Backward integration for supply assurance and cost efficiency** – Focus on reduction in stack & BOP cost through indigenization and scale – Manufacturing will cover multiple technologies such as Alkaline and PEM

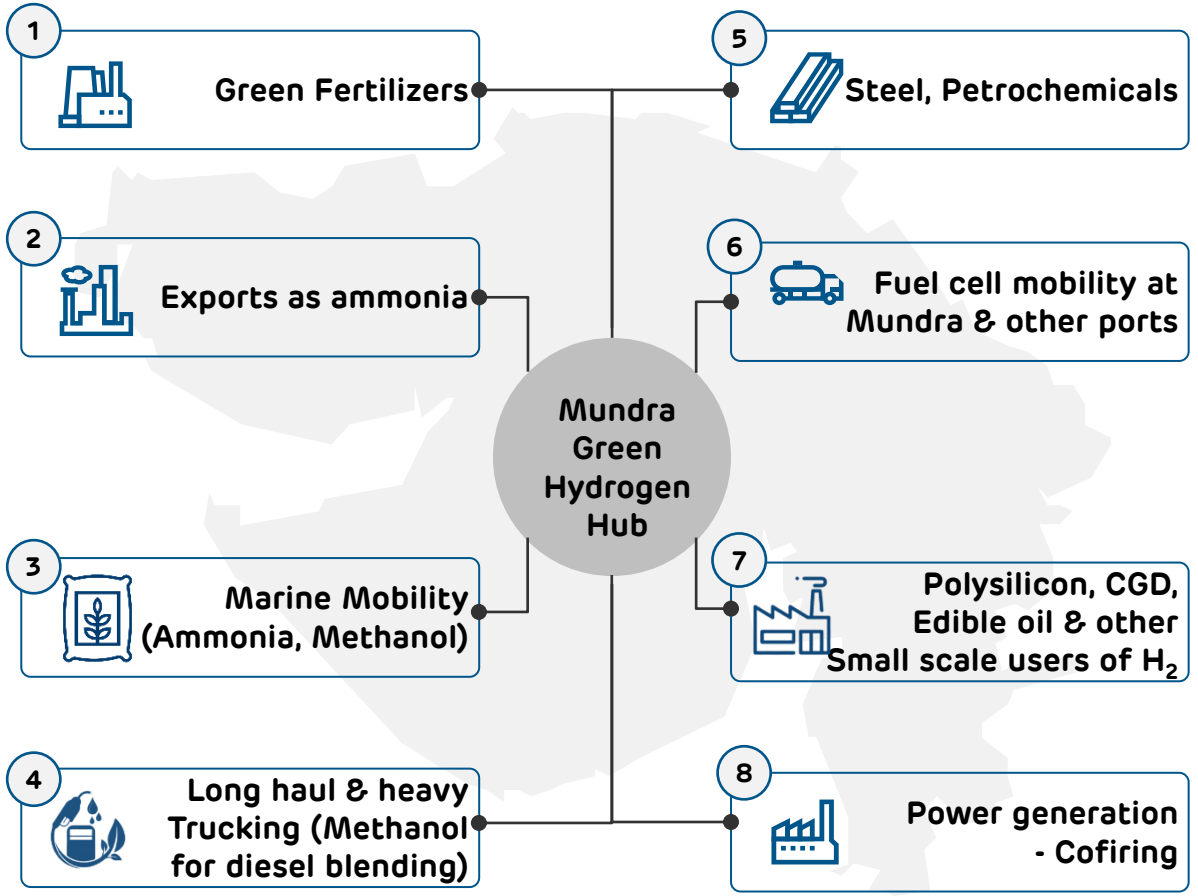
ANIL: Adani New Industries Limited; **AGEL**: Adani Green Energy Limited; **TOPCon**: Tunnel oxide passivated contact technology; **HJT**: Heterojunction technology; **WTG**: Wind Turbine Generator; **PEM**: Polymer electrolyte membrane; **KTPA**: kilo ton per annum; **RE**: Renewable Energy;

Ecosystem: The largest integrated Green Hydrogen Hub in the world at Mundra SEZ

Full suite of Hydrogen offerings …

RE capacity directly connected	~50 GW
Green Hydrogen	Upto 2.5 MMTPA
Green Ammonia	Upto 7.5 MMTPA
Green Methanol	Upto ~1.7 MMTPA
Hydrogen Compression & Storage	Supports 1.5 MMTPA ecosystem
Other technologies (LH_2, LOHC)	Available as required

… For multiple end uses including substantial captive use in Adani Portfolio businesses …



… And backed by credible action on ground

Only Hydrogen Hub developed by a player with
- Renewable and Port infrastructure expertise
- Downstream demand

Backed by ongoing investments
- Polysilicon capacity (30 KMTPA by FY25)
- MOU with POSCO for integrated Green Steel plant

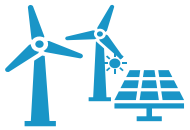
Enabling infrastructure in place
- Logistics network to North India hinterland
- Handling of Methanol / fuels, RE and power
- Demand from edible oil

RE: Renewable Energy; **PVC**: Polyvinyl chloride; **MMTPA**: Million Metric Tons Per Annum; **LH2**: Liquid Hydrogen; **LOHC**: Liquid Organic Hydrogen Carrier; **CGD**: City Gas Distribution; **KMTPA**: Kilo Metric Tons Per Annum; **GW**: Gigawatt; **MOU**: Memorandum of Understanding; **SEZ**: Special Economic Zone

ANIL: Green Hydrogen Ecosystem for First phase of 1.0 MMTPA

Key components of the project which is to be executed for 1.0 MMTPA Green H2 ecosystem include:

Hybrid RE Generation



- **~20 GW+** Renewable Energy

Electrolyzer for Green H2 production

- Up to ~**16 GW** +Electrolyzer capacity

Green H2 Compression

- **1 MMTPA** Green Hydrogen (H2) compression

H2 Pipeline

- **~200 Km +** pipeline

Green Ammonia

- **~5.6 MMTPA** Green Ammonia capacity or equivalent derivatives[1]
- Air separation Unit (ASU) for Nitrogen generation

Green Ammonia Offtake[1] / Green Urea

- Development of derivative transport infrastructure at Mundra port
- Export to EU, Japan and Korea
- Domestic demand
- Production of Green Urea (**2.8 MMTPA**)

1. We will also look at methanol production or LH2 possibilities as per Carbon Dioxide (CO2) availability and market study

Thank You