

*Presents*

International Conference on  
**GREEN & SUSTAINABLE IRON MAKING**

January 17 – 18, 2024

TITLE : ACME's Green Hydrogen and Ammonia Initiatives:  
A Leap Towards a Sustainable Future

Presenter : SHIROMANI KANT



Leading Through Innovation

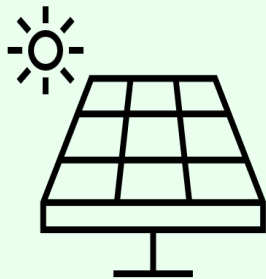


# ACME Group: Overview of Business segments

## Vision

To be amongst the top 5 Green Energy producers in the World  
Produce 10 Mn Tons Per Annum of Green Ammonia / Hydrogen by 2032

## Overview



Existing Renewable  
Portfolio: ~ 5.5 GWp  
Existing Green Ammonia  
Portfolio: 1.2 MnTPA\*

\*under construction

ACME diversified into

- ✓ Renewables Power
- ✓ Green H2 and NH3
- ✓ Sustainable Protein

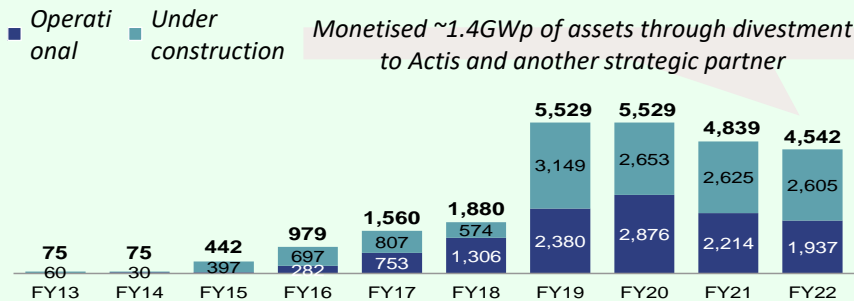
ACME was the first to achieve subsidy free solar tariff of USD 3 \$cent per unit tariff in  
India

# Renewable Power: One of the top renewable players in India

## Group overview

- One of India's largest renewable utility companies with a ~5 GWp portfolio.
- Built a solar plant in 2018 which still holds the record for lowest tariff for a completed solar project – INR 2.44/kWh (US\$0.03 per unit)
- Experience of designing and constructing 61 plants across 13 Indian states over the last decade

## On-book solar capacity evolution



ACME develops, builds, owns and operates utility-scale renewable plants

O&M

Land

Engineering

EPC

Legal

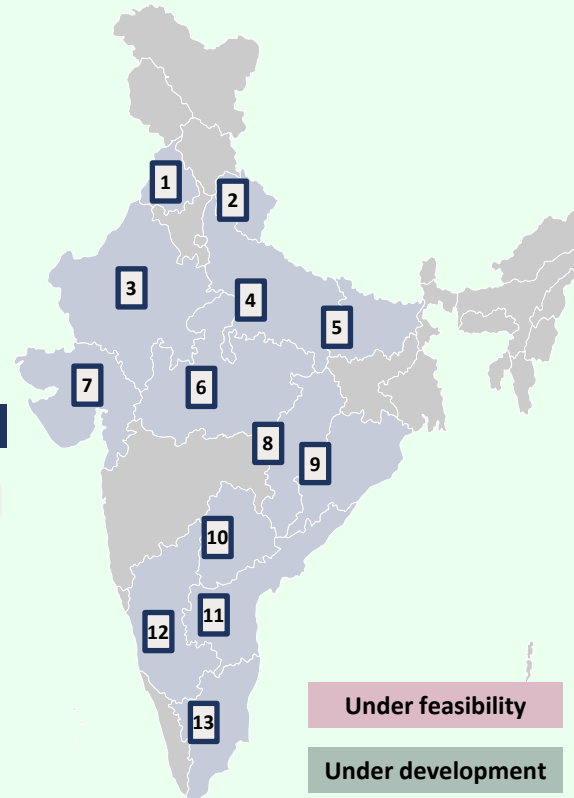
Procurement

Technology & Quality

Regulatory

Robust 750+ in-house execution team from engineering to O&M handling every aspect of solar business

## Key operating geographies in India



State	MWp
1 Punjab	109
2 Uttarakhand	64
3 Rajasthan	675
4 Uttar Pradesh	35
5 Bihar	27
6 Madhya Pradesh	31
7 Gujarat	15
8 Chhattisgarh	32
9 Odisha	32
10 Telangana	639
11 Andhra Pradesh	194
12 Karnataka	370
13 Tamil Nadu	-

Under feasibility

Under development

Under construction

# History of Disruption in Telecom & Energy industry

	Telecom Infra	Solar Business	Green Initiatives
Period	2003-2009	2010-Present	2019-Present
Disruption	<ul style="list-style-type: none"> <li>✓ Invented fit for market products in telecom passive infrastructure space including Power Interface Unit (PIU) and Phase Change Material (PCM)</li> </ul>	<ul style="list-style-type: none"> <li>✓ India's first IPP to achieve, build and operationalize a solar power plant with subsidy free tariff of INR 2.44 INR/kWh (~3 cents/kWh)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Commissioned World's first Green Hydrogen and Green Ammonia in Bikaner, Rajasthan</li> </ul>
Impact	<ul style="list-style-type: none"> <li>✓ Up to 70% reduction in telecom tariffs on account of energy savings contributing to lowering calling rates from \$0.20/minute to \$0.07/minute</li> </ul>	<ul style="list-style-type: none"> <li>✓ ACME's \$0.03/kWh (subsidy free) tariff broke the grid parity barrier for renewable power making it cheaper compared to average cost of thermal power by around 25% and accelerated adoption in solar power in India with 60 GW of present capacity and another 100 GW under-development</li> </ul>	<ul style="list-style-type: none"> <li>✓ Proof of concept as allowed for regulatory and policy push for adoption of Green Ammonia/Hydrogen in India</li> <li>✓ Execution experience enabling optimisation of design and operations for large scale Green Ammonia/Hydrogen plants</li> </ul>



- ❖ Acquired Astris Canada & Czech Republic in 2006
- ❖ Deployed more than 500 fuel cell for telecom infrastructure in India in 2007-08
- ❖ Setup first CSP plant in India in 2010
- ❖ First to adopt 150% overloading and value engineering to achieve 30% CUF without tracker

# Green Molecules: Bikaner pilot project

- › One of the world's first (probably the First) Green NH<sub>3</sub> project
- › Located in Rajasthan, India
- › Fully integrated Green NH<sub>3</sub> plant
- › 5 mtpd (30-110% variable capacity), Haber Bosch process
- › 5 mw solar plant
- › 2.5 mw Alkaline Electrolyzer
- › 35 mt Ammonia Storage



[Bikaner Plant](#)

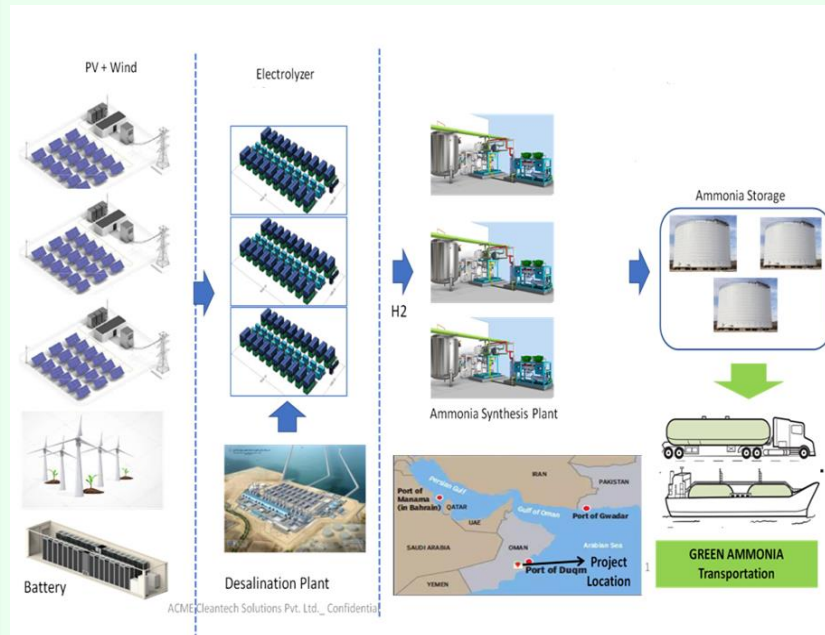


# Oman Project: First commercial scale Green NH3 project

ACME Oman is developing one of the world's earliest Green Ammonia project in port of Duqm, Oman

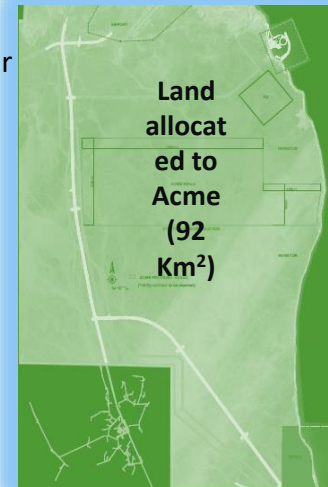
**Green NH3 ~ 0.9 MTPA (Phase 1, 2a & 2b); Investment ~USD 6+ billion**

- ✓ Land Acquired- Usufruct Signed (Ph-1)
- ✓ Statutory approvals in place
- ✓ Ph-1 Off-take Term sheet Signed, Agreement in Final Stage
- ✓ Ammonia Technology Order Placed
- ✓ Jetty Order Placed
- ✓ Ammonia Storage Tank Order Placed
- ✓ ESIA approved
- ✓ Construction permit granted
- ✓ Ph-1 Financial Closure done
- ✓ Exp. COD: 2H-2025



**Ph-1: 100 KTPA**

- > ~486 mw solar projects
- > ~320 mw alkaline electrolyzer
- > ~7 million litres/day desalination plant
- > 60kt of hydrogen storage
- > 25kt of green ammonia storage



## Key Partners



# Oman Project: First ever Green Certificate

## Green Certificate

### CERTIFICATE

Certificate-ID: C01-2022-03-21255363

Applied Standard/Criteria: TÜV Rheinland Standard H2.21 for Green Hydrogen, and Carbon neutral processing to Green Ammonia

Certificate Holder: Green Hydrogen & Chemicals SPC  
The Special Economic Zone Duqm  
Al-Duqm Al Wusta Governorate 111  
Oman

Certificate valid until: 31.03.2023

#### Production of Green Hydrogen and Green Ammonia

TÜV Rheinland confirms that the holder of this certificate is planning, as a Greenfield Project, a PV powered hydrogen-ammonia plant that meets all criteria for the production of Green Hydrogen as an intermedia product, as well as Green Ammonia as the final product.

The following criteria have been assessed as fulfilled for the entire Greenfield Project:

- Electrolysis for hydrogen production is planned to be exclusively powered by electricity generated from an affiliated PV plant, as renewable electricity source.
- The hydrogen is further synthesized to ammonia via Haber Bosch process in a carbon neutral way.
- During daylight hours, surplus electricity of the PV plant will be fed into the grid for banking purposes. Its amount will be higher than the power consumption needed for the entire plant during night times, also considering transmission and distribution losses (conservative approach).
- The technical setup of the project plant maintains carbon neutrality of hydrogen and ammonia in their boundaries cradle to gate. Since renewable electricity for electrolysis is applied, the products can additionally be declared as Green Hydrogen and Green Ammonia.

Cologne, 01.03.2022

Norbert Heideimann  
 TÜV Rheinland Group  
 Carbon Services

Daniel Gensdorff  
 TÜV Rheinland Group  
 Carbon Services

TÜV Rheinland®  
 Genau. Richtig.

Through its project in Duqm, ACME Company receives the world's first accredited international certificate for commercial clean hydrogen production



The Public Authority for Special Economic Zones and Free Zones (OPAZ) commended the announcement of ACME, a leading company in the renewable energy sector for receiving the first-ever international certificate accredited for commercial production of green hydrogen and ammonia in the world through its project in Duqm. The company obtained this certificate from the German technical services company TUV Rheinland.

عمان .. نبينها معا  
 Building Oman Together

الهيئة العامة للمناطق الاقتصادية الخاصة والمناطق الحرة  
 Public Authority for Special Economic Zones and Free Zones  
 Sultanate of Oman

TÜV Rheinland



**DEVELOPER:**  
Green Hydrogen and Chemicals SPC  
First Floor,  
Office # 4, Rock Garden Building  
Al Duqm, Sultanate of Oman.  
C.R: 1380188

**المطور:**  
الهيدروجين الأخضر والكيمياء س.ش.م  
الطابق الأول، حدائق الصخر، مبنى  
الحدائق الاقتصادية الخاصة بالذوق  
الذوق، سلطنة عمان.  
رقم الترخيص: ١٣٨٠١٨٨

**Project:**  
3300 MTPD Green Ammonia Project  
The Special Economic Zone at Duqm  
Al-Duqm, Sultanate of Oman  
SIGNBOARD PERMIT: 23/2022  
رقم الترخيص: ٢٣/٢٠٢٢

**المشروع:**  
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المحافظة الاقتصادية الخاصة بالذوق،  
الذوق، سلطنة عمان.  
رقم الترخيص: ٢٣/٢٠٢٢

**CONSULTANT:**  
Design Group Engineering Consultants  
PO Box 1102, PC 131, Al-Hamriyah,  
Sultanate of Oman  
C.R: 1218173

**الاستشاري:**  
مجموعة التصميم والاستشارات الهندسية  
ص.ب ١١٠٢، الرمز البريدي: ١٣١، الحميرية  
سلطنة عمان  
رقم الترخيص: ١٢١٨١٧٣

**Contractor:**  
Cleantech Solutions LLC  
The Special Economic Zone,  
Al Duqm, Al Wusta Governorate  
Sultanate of Oman  
CR 1426653

**المقاول:**  
الحلول التقنية النظيفة ش.م.م  
المحافظة الاقتصادية الخاصة بالذوق،  
الذوق، محافظة الوسطى،  
سلطنة عمان.  
رقم الترخيص: ١٤٢٦٦٥٣



**ACME was issued world's first Green Ammonia Certificate by TUV Rheinland, Germany**

# Green Ammonia Projects Pipeline



## Odisha

**Project Capacity – 1.2 MTPA**

- ❑ MoU signed with Govt. of Odisha in 2022
- ❑ To set up a 1.1 mtpa Green Hydrogen & Green Ammonia project.
- ✓ Government Benefits and Grants received
- ✓ Land lease signed; EIA waiver obtained
- ✓ Detailed Engg. (400 KTPA Ph-1) in progress



## Tamil Nadu

**Project Capacity – 1.2 MTPA**

- ❑ MoU signed in July 2022
- ❑ The project will be set up at the port town of Thoothukudi
- ❑ The project will comprise 5,000 mw of solar PV plant, 1.5 GW of the electrolyzer and 1.1 million tons of ammonia synthesis loop
- ✓ Government Benefits and Grants offered
- ✓ Land lease signed,
- ✓ Engineering & Feasibility studies in progress



## USA

**Project Capacity ~1.2 MTPA**

- ❑ Multiple Options identified for RE Power
- ❑ Pre - Feasibility Studies under process
- ❑ Ongoing customer & stakeholder discussions
- ✓ Secured land rights at Victoria Port in Texas
- ✓ Permitting & Approval process ongoing



**Aim to have a portfolio of 10 MTPA of Green Ammonia (or its equivalent Hydrogen) by 2032**



# India Project: Gopalpur Port, Odisha

## Project Description

- Odisha Govt. has offered several incentives and fast track approvals for the project.
- The plant will be designed for 1200 MTPD Green Ammonia Production capacity.
- The plant will operate at 300 MTPD production capacity in the beginning and later will be expanded to 1200 MTPD Capacity.
- The Process Plant will be installed for 1200 MTPD capacity from day 1 however the Solar and electrolyser capacities will be installed for 300 MTPD (Ph-1) equivalent ammonia production capacities only.
- The Solar (375 MWAC > 1375 MWAC) and Electrolyzer (320 MW > 1280 MW) capacities will be expanded in due course as the demand increase in near future.



## ACME Group signs agreement with Tata Steel subsidiary for green hydrogen project in Odisha

1 min read • 25 Aug 2023, 07:16 PM IST

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The company has signed the agreement with Tata Steel Special Economic Zone for 343 acres of land at its Gopalpur Industrial Park

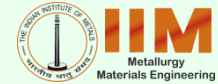


The company plans to set up a 1.3-MTPA green ammonia production facility, which will be produced from green hydrogen

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New Delhi: **Renewable energy** firm ACME Group on Friday said it has signed a land agreement with Tata Steel Special Economic Zone (TSSEZL) for 343 acres for its green hydrogen and green ammonia project at the Gopalpur Industrial Park in Odisha.

**TATA STEEL**  
WeAlsoMakeTomorrow



# Greenko, ACME, Reliance Among Winners of SECI's Green Hydrogen Manufacturing Auction

SECI's 410,000 MT Green Hydrogen Production under SIGHT Program Tranche 1 : **MERCO** INDIA RESEARCH

Bidder/Developer	Capacity	Average Incentive	
	MT	(₹/kg)	(\$/kg)
UPL Limited	10,000	0.00	0.000
CESC Projects	10,500	0.00	0.000
Reliance Green Hydrogen and Green Chemicals	90,000	18.90	0.227
Welspun New Energy	20,000	20.00	0.240
HHP Two	75,000	25.04	0.301
Torrent Power	18,000	28.89	0.347
Acme Cleantech Solutions	90,000	30.00	0.360
Greenko ZeroC	90,000	30.00	0.360
JSW Neo Energy	6,500	34.66	0.416
<b>Total</b>	<b>410,000</b>		

Note: \$1 = ₹83.31

\* NOTE - JSW Neo Energy won 6,500 MT out of the 10,000 MT capacity quoted

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## ACME Group secures Rs 4,000-cr loan from REC for Oman green hydrogen project

PTI - Last Updated: Jul 21, 2023, 05:37 PM IST

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**Synopsis**  
REC Chairman and Managing Director Vivek Kumar Dewangan said in the statement, "REC expresses its eagerness to collaborate with ACME Group across the entire renewable energy value chain. These projects are poised to play a pivotal role in facilitating the energy transition journey and contributing significantly to achieving India's green energy targets."





Leading Through Innovation