

# ATOME

green hydrogen & ammonia

## THE COMMODITIES OF THE FUTURE, TODAY



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# EXECUTIVE SUMMARY

ATOME

ATOME is now a world-leader in the green hydrogen and ammonia industry thanks to its fast-track projects strategy and a project pipeline of 500MW with first income in 2023

**WORLD LEADING**

The only London Stock Exchange company giving investors direct access to the commercial production & sale of green hydrogen and ammonia across numerous projects

**H2 + NH3**

Of the 400MW opportunity in Paraguay, the first phase of 60MW Power Purchase Agreement (PPA) has been signed at a highly competitive cost of power, targeted to produce 55,000 MT/year of clean ammonia by Q1 2025 increasing up to 360,000 MT/year by 2027

**PPA SECURED**

With the hydroelectric power available today, AECOM has been appointed as Owner's Engineer and Front-End Engineering & Design process now underway with view of reaching Final Investment Decision for first 60MW phase by end 2022

**GREEN NOW**

ATOME Mobility to produce green hydrogen for heavy transport. First revenue targeted for early 2023. 1MW electrolyser to be commissioned in Paraguay location early 2023

**CLEAN FUEL**

Building a pipeline of world-class assets, the first being the Paraguay project, to attract global energy infrastructure investors providing options of early monetization (farmout/buyout/offtake) and new opportunities

**PIPELINE**

# INVESTMENT CASE

ATOME

## BASE ADVANTAGES

- Only London Stock Exchange company directly addressing global climate and food security issues giving investors direct exposure to the exponentially growing green hydrogen and ammonia market
- Access to low-cost available renewable power in the EU and South American regions
- Technologically agnostic to achieve best value and optimise scale and time to production
- Stable, democratic countries with clear hydrogen roadmaps and access to nearby EU and Mercosur markets

## FAST-TRACK

- ATOME focuses on fast production, realistic scales and existing infrastructure
- Targeting accelerated cash flow and early revenue starting in 2023 through ATOME Mobility operations followed shortly by Villeta<sup>[1]</sup>
- To benefit from generation of carbon credits and commercial sales of oxygen

## GREEN IS CHEAP

- The cost of grey hydrogen and ammonia (made from fossil fuels) tripled during 2021 and prices remain at high levels
- Cost of energy represents over 70% of the cost of hydrogen, securing long-term PPA is critical to ensuring a low-cost production and ensuring long-term competitiveness

## SIZE OF THE PRIZE

- Green hydrogen market expected to reach \$1.4 billion by 2026
- Goldman Sachs assumes a US\$10 trillion-dollar addressable green hydrogen and ammonia market by 2050 with an estimated US\$5 trillion investment needed in the whole value chain.<sup>[2]</sup>
- Increasing scale of government funding: EU Commission recently announced EUR5.4 billion of funding available and entirely dedicated to environmental, climate and energy objectives

## DEMAND IS HERE NOW

- Green hydrogen is widely recognised as the essential tool to decarbonise and achieve Net Zero goals
- Within the next decade, global demand for renewable and low carbon hydrogen could grow by 50%, according to a new Hydrogen Council report<sup>[3]</sup>
- A number of governments have already announced the end of the sale of new petrol and diesel cars in the UK by 2030 and is currently consulting on phasing out the sale of new diesel and petrol heavy goods vehicles (HGVs) by 2040.<sup>[4]</sup>

ATOME

MACRO

1. Please refer to the brokers' research reports for full details on Company financial projections

2. Goldman Sachs – estimates of possible future scenarios

3. world-energy.org

4. Gov.uk – funding announced for green auto tech

# EXPERT, EXPERIENCED MANAGEMENT

ATOME



**Peter Levine**  
Chairman

Peter MA (Oxon) is the Chairman CEO and principal shareholder of ATOME's largest shareholder, President Energy. As the executive Chairman, founder and single largest shareholder of the then FTSE 250 Imperial Energy, he oversaw the growth from 25p at flotation to 1250p until its \$2.4 billion sale in January 2009

Between 1993-2008, Peter Levine was Deputy Chairman and then Chairman of the then FTSE 250 listed steel construction company, Severfield-Rowen (now Severfield), and was also Chairman of Keltbray Plc



**Olivier Mussat**  
Director and CEO

Olivier BA, MS, has joined ATOME from being the Chief Investment Officer of Global Energy at the IFC, part of the World Bank Group

After starting his career as a field engineer in energy, he is a recognised expert in funding and managing infrastructure assets for Oil & Gas, Power & Renewables, leading over \$500M of equity investments in early stage companies and over \$30bn of corporate and structured debt finance transactions



**James Spalding**  
Director and President of Atome Paraguay

James BA, MA, was the Paraguayan General Director of the jointly owned Paraguay-Brazil hydroelectric dam Itaipu Binacional between 2013-2018, the second largest hydroelectric dam in the world

Prior to that he was for six years the Ambassador of Paraguay in the US, serving in 2009 as Dean of the Latin American Ambassadors Group (GRULA). He has also served as Paraguay Minister of Finance and as the Governor of Paraguay to the IDB and World Bank group



**Mary-Rose de Valladares**  
Independent Non-Executive Director

Mary-Rose MA, MBA, was the longstanding General Manager of IEA Hydrogen. An expert in renewables and hydrogen, she was formerly at the U.S. DOE National Renewable Energy Laboratory (NREL) serving as the renewable and energy efficiency developer at the Centennial Olympics in Atlanta, GA, USA, the first green Olympic Games

She served on the National Hydrogen Association Board of Directors and founded New Mexico Solar Energy Industry Association



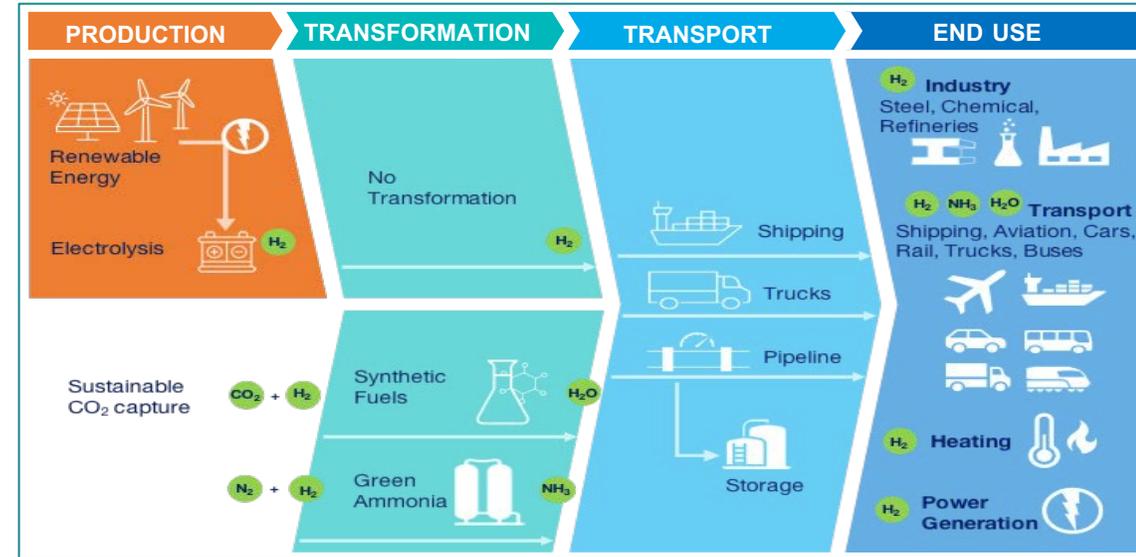
**Sigurður Ólason**  
CEO of 75% owned Icelandic subsidiary, Green Fuel

Sigurður BSc, MBA, has worked in a number of roles in the maritime food processing industry, most recently at Marel Fish where was in charge of the global fish industry at the company

During his time, he was integral to growth of the business which impressively increased from EUR 650mn to EUR 1.2bn. An expert in maritime business, Sigurður has extensive experience in Icelandic operations from his time with Samherji, one of Iceland's largest marine operators

# HYDROGEN – THE RIGHT TIME NOW MORE THAN EVER

- The use of hydrogen today is widespread including fertilizer production; refining; chemicals; iron & steel; glass. Over 99% of hydrogen is made from fossil fuels
- Green hydrogen, produced via electrolysis powered by renewable energy, is cornerstone to decarbonizing heavy industries and hard-to-abate sectors such as agriculture and shipping
- Low carbon hydrogen is estimated to supply up to 25% of the world's energy by 2050 and become a US\$10 trillion addressable market opportunity<sup>1</sup> – equivalent to over 20mm bbl of oil taken out of the market per day
- Over time, electrolyser costs are expected to follow the same decline curves experienced in solar panels, wind farms and battery storage
- The soaring costs of natural gas and carbon means that the cost to produce green hydrogen is already cheaper/on par with grey and blue alternatives



Color	GREY HYDROGEN	BLUE HYDROGEN	TURQUOISE HYDROGEN*	GREEN HYDROGEN
Process	SMR or gasification	SMR or gasification with carbon capture (85-95%)	Pyrolysis	Electrolysis
Source	Methane or coal	Methane or coal	Methane	Renewable electricity

Note: SMR = steam methane reforming.  
\* Turquoise hydrogen is an emerging decarbonisation option.

Images: International Renewable Energy Agency

# AMMONIA AND THE URGENCY FOR GREEN



Ammonia (NH<sub>3</sub>) is the second most produced chemical in the world, and a global commodity, derived almost entirely from fossil fuels



70% of all NH<sub>3</sub> worldwide is used for fertilisers, strongly contributing to agriculture and land-use accounting for around 25% of global GHG emissions



150m MT/yr global production (2019). Set to over 350 million MT/yr by 2050 due to the increasing usage of ammonia across sector

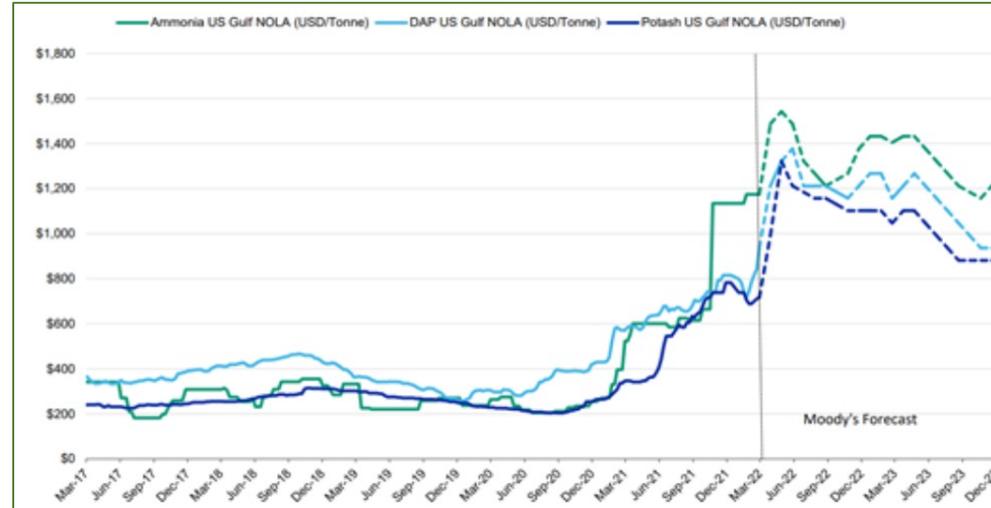


Efficient and easier to store and transport than hydrogen and enables commercial energy transport to help satisfy global clean energy demand



Green NH<sub>3</sub> is key for decarbonization of fertiliser, chemical, refining and shipping fuel industries

## 5 YEAR FERTILIZER PRICES



## NEED FOR GREEN

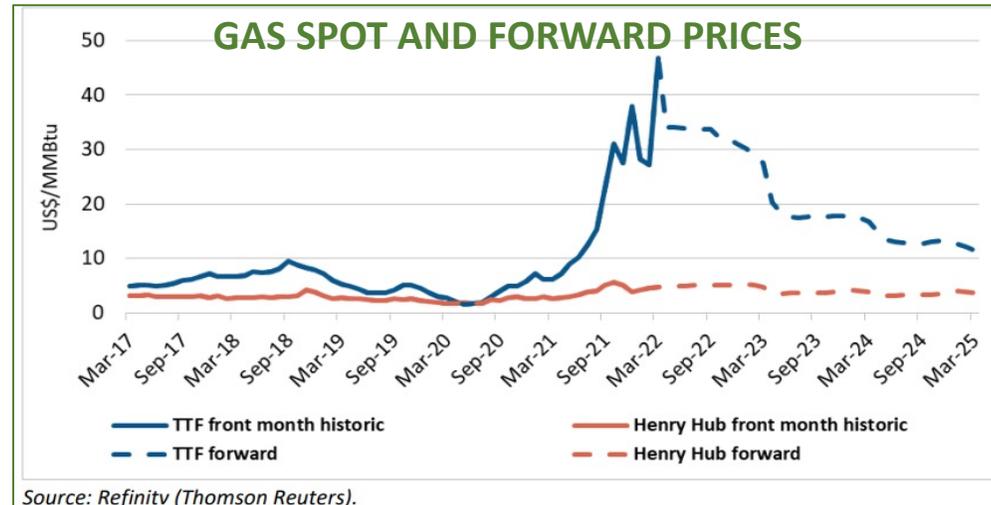
Over 99% of global ammonia production is derived from natural gas. Moody's forecasts prices to remain at historic highs led by LNG market, the only alternative to Russian gas for Europe

Since ATOME listed in December 2021, prices of ammonia, natural gas and carbon prices increased by over 30%. At highs of \$1500/MT, ammonia prices have risen 5x since 2020 - levels not seen since 2008

Russia, Belarus and Ukraine supply over 30% of global fertilizer and crop exports

The need to diversify to decentralized green ammonia has never been stronger, and the high ammonia and natural gas prices make ATOME projects more economical than grey hydrogen. Green ammonia is increasingly considered as a viable option to replace dependency on Russian gas

## GAS SPOT AND FORWARD PRICES



Source: Refinitiv (Thomson Reuters).

# PARAGUAY 400MW PROJECT

ATOME

green hydrogen & ammonia production



Itaipu Dam, Paraguay

# THE PARAGUAY OPPORTUNITY

## COUNTRY PROFILE

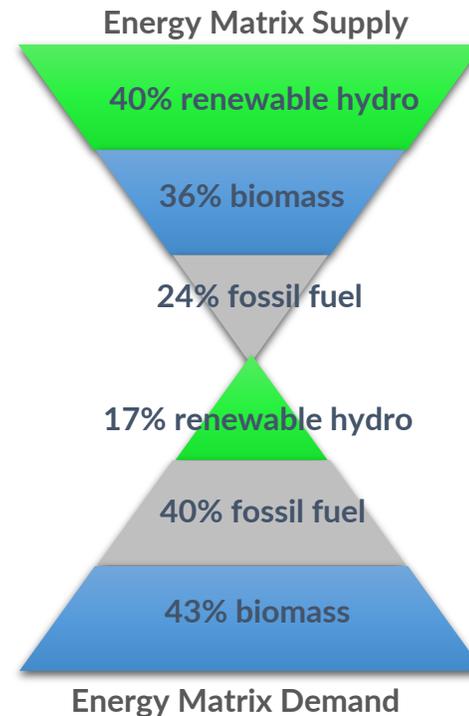
- BB+ Fitch rating, a stable open economy, with a solid banking system oriented toward international standards. Tariffs are low and obstacles to business and trade are minimal in comparison to other countries in the region
- Fastest growth in the region following COVID-19 due to its stability and macroeconomic discipline, it recorded the smallest GDP contraction in the Latin American region
- Landlocked country heavily dependent on land and river transport for the import/export of goods
- In 2020, Paraguay exported US\$2.1 billion in Soybeans, making it the 4th largest exporter of soybeans in the world. Agriculture retains 20% of country's total employment

### PARAGUAY - KEY FACTS

Corporate Tax Rate	10%
GDP	4.5% growth in 2021 (Fitch, 2021)
Energy Policy	Reduce dependency on hydrocarbons and capitalise on hydroelectric capabilities
Fertiliser Consumption	396.37 kg/ha (twice the global average in 2017)
Fertiliser Import	US\$446 million (2019)
Annual Transport Sector Growth (2012-19)	Cars (11.6%), buses (4.6%) and trucks (6.6%)

## ENERGY IN ABUNDANCE

- Renewable power on tap 24/7 from Itaipu Dam, the second largest dam in the world by output, jointly owned by Paraguay and Brazil (Itaipu Binacional)
- Paraguay only uses 30% of its 50% share of power, exporting 40,000 GWh of electricity back to Brazil or Argentina, with some of the lowest electricity rates domestically in LatAm (approx US\$ 41/MWh)



## TARGET MARKET

- Domestic offtake markets for hydrogen and ammonia products for the **agriculture industry** - imports all of its primary energy and fertilisers - only mixers of ingredients are present in Paraguay
- **Transport sector** - reliance on HGVs and the world's third largest fleet of barges to transport industrial production - both need to be decarbonized
- Active climate commitments from the Government to reduce fossil fuel consumption by 20% and increase use of green electricity-based power - strategy highlighted in its July 2021 hydrogen roadmap



Itaipu Dam

# PARAGUAY PHASE 1: 60MW VILLETA PROJECT



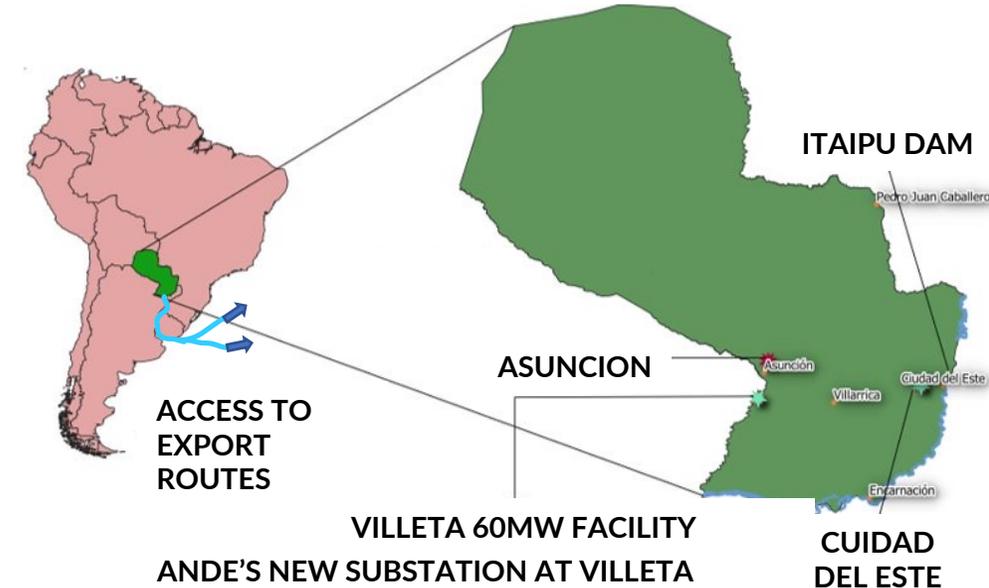
## FIRST STEP TOWARDS NEAR-TERM PRODUCTION OF GREEN HYDROGEN AND AMMONIA IN PARAGUAY

### First Major Power Agreement Signed

- 60MW PPA signed with ANDE, the national power company of Paraguay, as first step of Phase 1 with the capacity to increase at the Villeta substation to 100MW
- Power pricing at lowest industrial standard tariff making ATOME very cost competitive in both domestic and international marketplaces
- Single largest PPA ever signed between ANDE and an industrial user
- Stable long term price of the PPA ensures project competitiveness versus highly volatile international hydrocarbon and grid prices

### Phase 1 Villeta

- 100% green power to be provided via ANDE's new substation in Villeta, on the navigable River Paraguay, 35km south from the capital Asuncion
- Villeta hosts an industrial complex home to major fertiliser and cement companies and the main shipping port for exports from Paraguay
- No need for costly and time-consuming building out of power generation infrastructure bringing material capex savings
- Facility to be operational within 3 years and capable of producing 55,000MT/yr of green ammonia at full 60MW capacity and to be scaled up on the existing site



### VILLETA PROJECT TIMELINE

- Appointing FEED contractor by Q3 2022
- FEED completion by Q4 2022
- Final Investment Decision by end of 2022
- Commencement of construction works phase by H1 2023

# PARAGUAY PHASE 2 – ITAIPU/YGUAZU 300MW+ PROJECTS

ATOME

- ATOME is upscaling its original Phase 2 projection, making a total of 400MW for both phases in Paraguay
- Fast-track negotiations with ANDE for the 300MW PPA
- The Company is also in advanced discussions with offtakers, with firm interest shown in all of ATOME's prospective Paraguay production
- Targeting Phase 2 commencement of production for 2025/2026 with FID by end 2023

## Next Steps

- Entry into a definitive PPA with ANDE – advanced discussions
- Formalising arrangements for land and access to water
- Formalising arrangements for project planning & engineering, procurement of equipment, and infrastructure build out
- Accessing the domestic and international fertilizer market

## Significance

- Leveraging the project development at Villeta in order to fast-track the phased build-out to 400MW
- ATOME progresses discussions with a number of green infrastructure investment funds interested in investing at project level as well as on concessional finance/grants, governmental and international multilateral funding



## ATOME MOBILITY – MOVING FORWARD

- Aim to launch production facility to produce green hydrogen for the heavy transport sector and establish an early presence in the LatAm clean fuel market
- First electrolyser (1MW) ordered for installation in Q1 2023 to produce 450kg/day of hydrogen from AIM-listed Clean Power Hydrogen (CPH2)
- Global engineering firm AECOM contracted as engineering consultants for the project
- In advanced discussions with equipment suppliers, vehicle manufacturers, offtakers, and in the process of securing support from government and multilateral financial institutions

## PARAGUAY – IN NEED OF CLEAN FUEL

- No railways – all main industries dependent on long-haul trucking and other heavy transport
- Imported fuels such as diesel and gasoline cost Paraguay US\$1.3 billion per year with the transport sector accounting for 93% of all petroleum product consumption in Paraguay
- The cost of its fuel imports has doubled in the last 12 months and the cost of diesel subsidies increased by over US\$100 million whereas the cost of electricity has been stable and is expected to reduce

## FUEL CELL VEHICLE (FCEV) – WHY NOW?

- There is a need to decarbonise the transport sector. Today, out of 43,000 FCEVs, 20% are buses and trucks, emphasizing a shift to the long distance-segment.
- FCEVs could make up 20% of all vehicles by 2050 including 20 million trucks and 5 million buses (The Hydrogen Council)

TRUCKS	Hydrogen-powered vehicles	Electric Vehicles	Diesel
Power Unit	Hydrogen Fuel Cell	Battery	Diesel Engine
Refueling time est.	10-15 minutes	Several hours	10 minutes
Range est.	500-700 miles	100-300 miles	500-750 miles
Emissions	Zero emissions	Zero emissions	Heavy emissions
Grid Limitations	No	Yes	No



Site preparation underway for of 1MW electrolyser installation



# ICELAND PROJECTS

ATOME

green hydrogen & ammonia production



Green Fuel production facility site at Bakki, Iceland

# THE OPPORTUNITY – SHIPPING AND ACCESS TO EU MARKETS

- Renewable energy makes up almost all of Iceland’s electricity production with 75% from hydropower and 25% from geothermal
- Iceland has a significant shipping and fishing industry which is under pressure from the IMO to decarbonise its operations. Iceland’s maritime sector also has a large presence relating to land transport (trucks, HGVs) in the country
- Iceland’s Hydrogen roadmap stresses the importance of reducing fossil fuel use in transport and shipping, e.g. new registrations of fossil fuel cars will be banned after 2030

ICELAND – KEY FACTS	
Corporate Tax Rate	20%
GDP	US\$ 21.7 billion
Energy Policy	Reduce reliance on fossil fuels for transport and shipping sectors
Maritime industry	25 to 30 percent of the country's GDP and 15 to 20 percent of its employment.
Oil imports	\$605 million (2019)

## SOLUTION TO SHIPPING

**CHALLENGE:** maritime transport emits 940 million MT of CO2 annually, equating to 2.5% of global GHG emissions

- The investment needed to meet the International Maritime Organisation’s climate target (50% reduction in emissions by 2050) is \$US0.8-1.2 trillion, an average of \$40-\$60 billion annually over the next 20 years (Oxford Energy Forum, 2021)
- In 2021, the World Bank estimates a US\$1 trillion market opportunity from the decarbonisation of shipping (World Bank, 2021)

**THE SOLUTION:** By 2050, ammonia could make up 25% of all maritime fuel, with all new ships from 2044 running on ammonia (Ammonia Energy Association, 2019)

## Comparison of shipping fuel characteristics

	Marine gas oil	LNG	Methanol	Green Ammonia	Green H2
Type	Fossil fuel, high carbon	Fossil fuel, high carbon	Low-carbon	Zero GHG emitting	Zero GHG emitting
Temperature for liquid storage	Ambient	-162°C	Ambient	-34°C	-253°C
Tank volume for 1,000 nautical mile range	73m <sup>3</sup>	164m <sup>3</sup>	169m <sup>3</sup>	299m <sup>3</sup>	555m <sup>3</sup>
Suitable application	Short and long	Short and long	Short and long	Short and long	Short

# ICELAND – TOWARDS PRODUCTION

ATOME has a 75% interest in Green Fuel ehf, an Icelandic based green hydrogen and ammonia company, managed by experienced local management who own the other 25%

MOU to secure up to 100MW of power, with support from Ministry of Industry; the local municipality

Part of the Schengen Zone and in close proximity to Europe to develop an export market and benefit from EU's increasing number of grants and subsidies dedicated to green energy ventures

MOU with Haldor Topsoe, for the development of commercial and tech solutions for Green Fuel's project for SOEC technology

Letters of Support for offtake in place with: Green Energy Park near Bremen, Germany  
The city and port of Groningen, The Netherlands

Advanced discussions with the Icelandic government, power suppliers and offtakers

## Iceland Production Estimates

	Phase 1 2024/5	Phase 2 2025/6	Total
Installed power capacity	30MW	70MW	100MW
Electrolyser technology	Alkaline (likely)	(SOEC)	Alkaline/SOEC (mix likely)
H <sub>2</sub> production per year	5,536 MT	13,214 MT	18,750 MT
NH <sub>3</sub> production per year	31,000 MT	74,000 MT	105,000 MT
O <sub>2</sub> by-product per year	44,286 MT	105,714 MT	150,000 MT

# SUMMARY AND OUTLOOK

- ATOME currently on track to be one of the first large-scale producers of green hydrogen and ammonia in the world
- Natural gas and carbon markets mean green hydrogen & ammonia is more viable than ever before with greater focus on energy security and food security
- With PPA for 60MW for Phase 1 now signed, ATOME enters FEED stages where it will announce technology providers, EPC, offtaker and financial advisor on its path to targeted FID by end of 2022
- ATOME Mobility will commence production in H1 2023
- Expediting steps towards securing Phase 2 in Paraguay for 300MW and further PPAs in Iceland
- ATOME continues to explore green hydrogen and ammonia opportunities globally in jurisdictions with strong demand for ATOME's production

	2021		2022				2023				2024				2025			
ATOME Timeline	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Admission to AIM	✓	✓																
PPAs, procurement, planning & development to FID			✓	✓	»»»													
Declaring FID																		
Building out facilities early start-up of production																		
Scaling up production to full cycle																		
Expanded production into 2026/27																		

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ATOME

green hydrogen & ammonia production



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