



Cipher Neutron

Green Hydrogen Production at the Lowest Affordable Prices

Our name: Cipher is an Arabic word for zero. Hydrogen is the only element with zero neutrons, hence the name Cipher Neutron.

About Cipher Neutron

Cipher Neutron

A Canadian cleantech company focused on
Green Hydrogen production

North America's 1st and 2nd company in the world to commercialize
AEM Electrolysers

World's 1st company to have patent pending
Reversible Fuel Cells

Trusted and funded by governments

Industrial partner of many Canadian universities and public research organizations



Hydrogen Market



Fertilizer Industry

Market Size: (\$ 80 Billion)

Applications:

Ammonia Production



Oil & Gas Industry

Market Size: (\$ 40 Billion)

Applications:

Oil and Gas Processing



Chemical Industry

Market Size: (\$ 10 Billion)

Applications:

Methanol production
Other chemicals



Mining Industry

Market Size: (\$ 5 Billion)

Applications:

Smelters
Metal/Ore reduction



Industrial Use

Market Size: (\$ 2 Billion)

Applications:

Food Industry
Steel Industry

Green Hydrogen Future

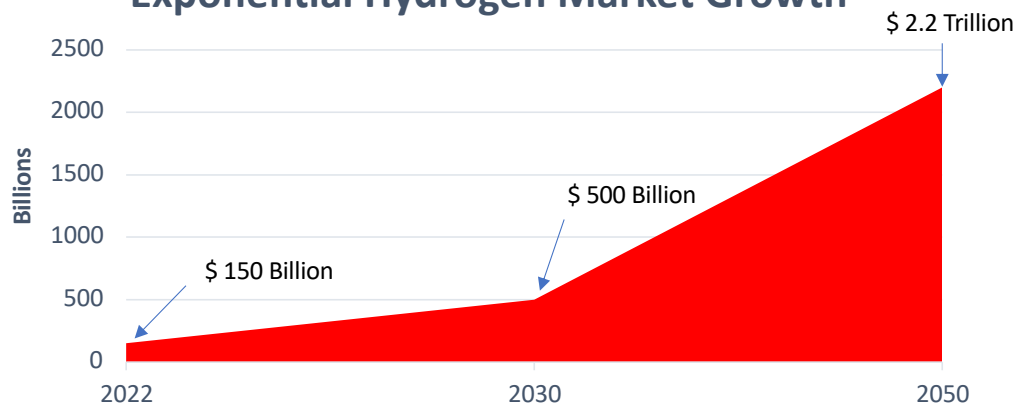
Hydrogen Market to grow more than 10 folds by 2050

More than 70% of the Hydrogen will be Green Hydrogen by 2050

AEM Technology will play a major role replacing PEM & Alkaline electrolyzers

Hydrogen will be a major source of energy replacing conventional energy resources

Exponential Hydrogen Market Growth



Traditional Green Hydrogen Production Methods

Alkaline Electrolyzers

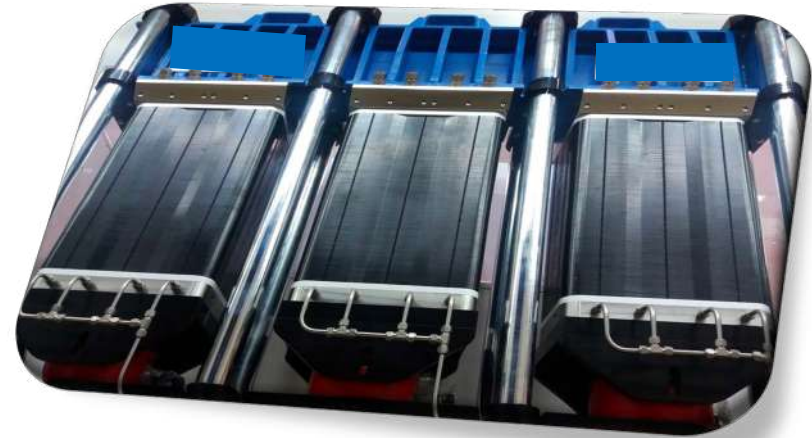


Alkaline electrolysis is the oldest technology to split water into H₂ and O₂ using a diaphragm.

Problems with Alkaline Electrolyzers:

- ❖ **In-efficient** (Higher operating cost)
- ❖ **Low Pressure Hydrogen Production** (increases OPEX and CAPEX)
- ❖ **Do not work with intermittent energy** (Solar panels, wind energy)
- ❖ **Highly Corrosive** (Hard to handle)
- ❖ **Huge footprint** (Increases CAPEX)

PEM Electrolyzers



PEM (Proton Exchange Membrane) electrolysis is a membrane-based technology to split water.

Problems with PEM Electrolyzers:

- ❖ **Use of Platinum Group Metals(PGMs) including Platinum, Iridium** (High OPEX)
- ❖ **Supply Chain Constraints** (More than 80% PGMs are in South Africa)
- ❖ **Use of Harmful and toxic chemicals** (PFAS based membrane in PEMs)
- ❖ **Sustainability issues** (PFAS ban)

Introducing Cipher Neutron's **AEM Electrolyser**

- ✓ **Affordable**
Lower Capex
Lower Opex
- ✓ **Sustainable**
No PFAS
No PGMs
- ✓ **Supply Chain**
Locally sourced materials
- ✓ **Longer Life-Time**
Up to 10 Years



10 kW AEM Stack
Hydrogen Production: 2000 liters/hour
Pressure Range: 0 - 30 Bar

Cipher Neutron's AEM Benefits



Highly Efficient

81.73% efficiency vs industry standard of 77% (HHV@ 1.8V)



High Ampacity

High current density (1.1 amps/cm²) enables more H₂ production per unit area (@1.9 V)



High Pressure

Eliminates the need for expensive secondary compressors up to 30 bars.



Sustainable

No Use of PFAS and other harmful chemicals



Short Lead times

AEM Electrolysers do not rely on supply-chain constraint materials



Price Reduction (up to 30%)

Less than \$700 (USD) per kW (@250 kW stack)

1. High Efficiency enables more hydrogen production using the same amount of energy/power. This results in lower operating costs to produce H₂.
2. High Ampacity enables more hydrogen gas from a given area.
3. High Pressure enables easy storage of hydrogen and also eliminates the need to buy expensive hydrogen compressors to compress hydrogen.
4. Compact design enables less material required for the manufacturing of the electrolyser. This leads to lower Capex.
5. No precious metals enables electrolysers more sustainable and affordable.
6. Price reduction in AEM is significant due to its compact design and the elimination of expensive rare earth and precious metals.

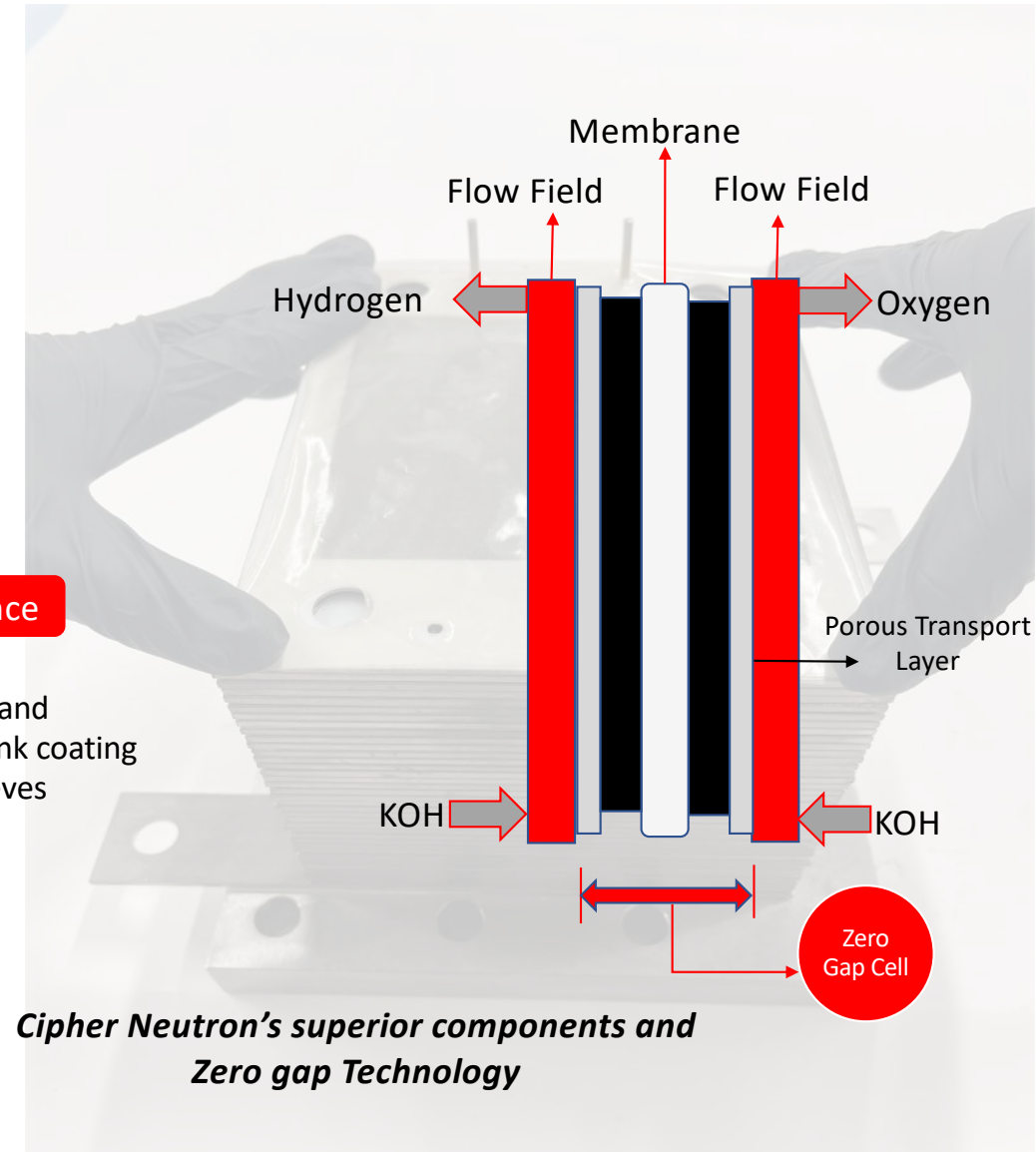
Cipher Neutron's Superior AEM Technology

CIPHER NEUTRON

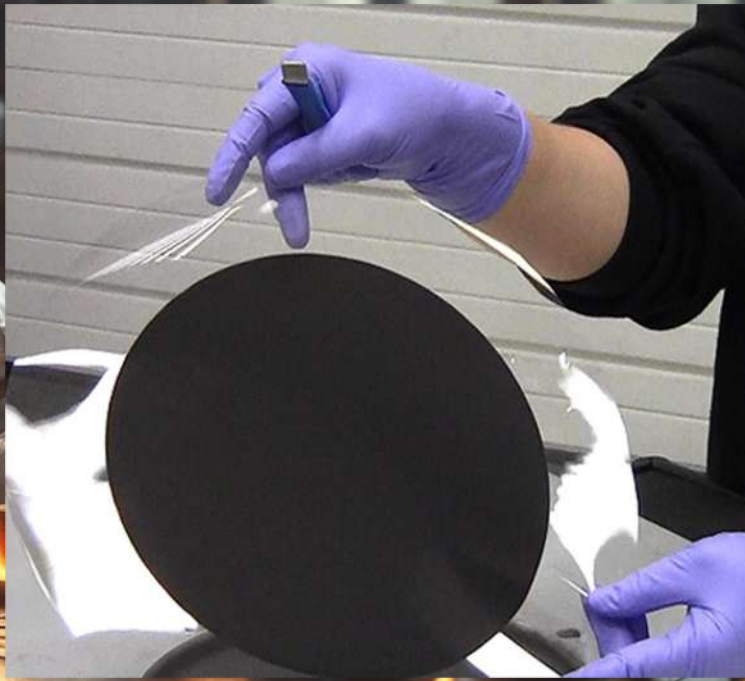
Patents
Patent Pending: Cipher Neutron has patent pending flow field design

Advanced Science
Ink coating: Unique ink recipe and methodology for ink coating membranes, achieves higher efficiencies

State-of-the-art
AEM: uses state-of-the-art Anion exchange membrane to separate H₂ and O₂ gases



Minimum Degradation



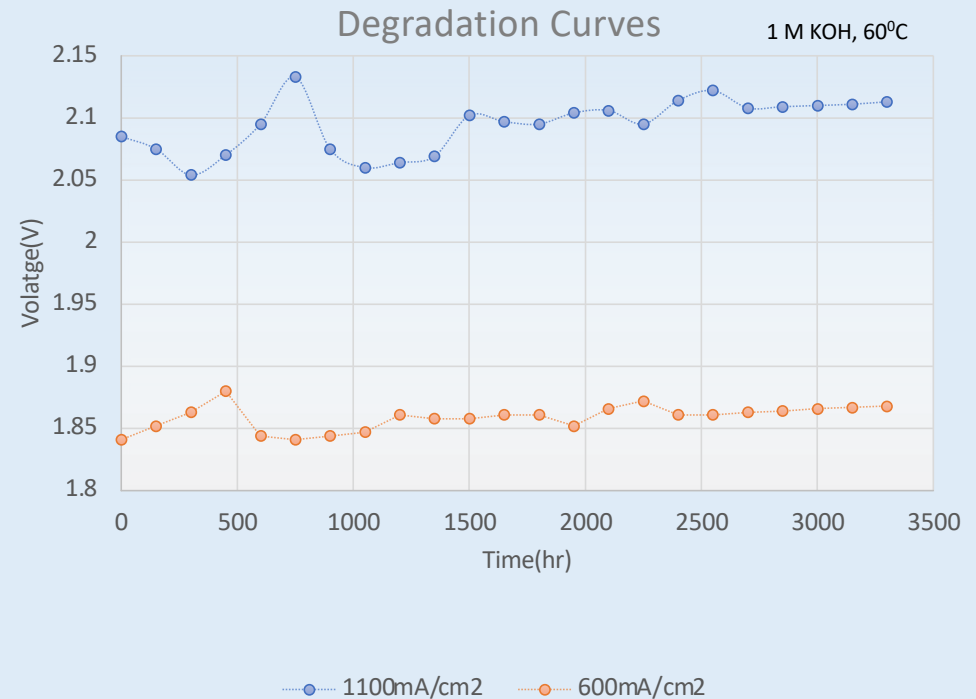
Less than 0.45% Degradation recorded after per 1000 hours

Less than 4% Degradation when extended on yearly basis

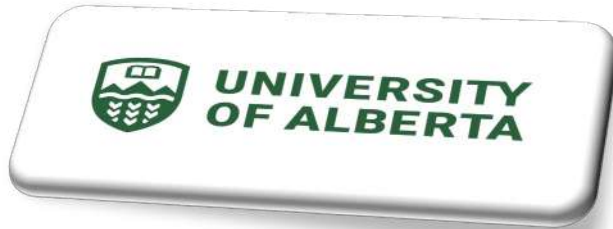
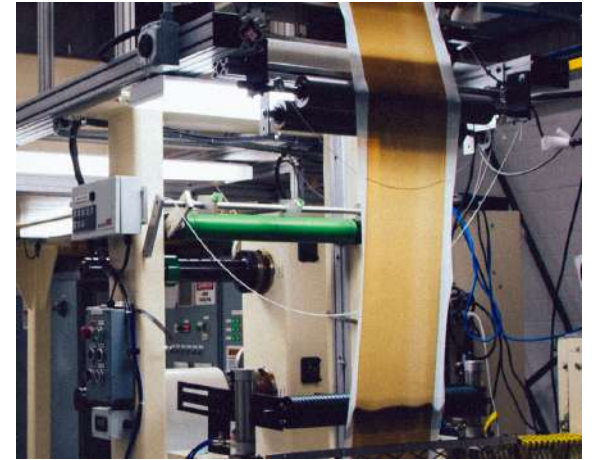
European benchmark for maximum allowed degradation is 9%

Expected Lifetime Of Our Electrolyser is 10 Years

3300 hrs of performance of AEM Electrolyser at constant current density (600 mA/cm² and 1100 mA/cm²)



Research Partners



Some Noteworthy Projects

SFU Hydrogen Hub



Building Canada's largest Hydrogen Hub using AEM Electrolysers.

Cipher Neutron has been awarded the contract to supply AEM Electrolysers to build one of Canada's first and largest hydrogen hubs. The location of this hydrogen hub is planned to be located in Burnaby, British Columbia, Canada. The bidding of this contract went unchallenged as this was a highly complex project of grand proportions which testifies to the Company's advancements and notoriety in Canada's hydrogen economy.

Some Noteworthy Projects

Blackrock Project – Green Steel



Cipher Neutron is proud to announce its collaboration with the world's first-of-its-kind green steel project of Strategic Resources (Blackrock), aimed at revolutionizing steel production through sustainable practices. This innovative partnership entails the utilization of green hydrogen to power the Electric Arc Furnace (EAF) at the deep-water Port of Saguenay in the Province of Quebec, in Canada, marking an important milestone in the transition towards carbon-neutral steel manufacturing. At the feasibility stage of the project, Cipher Neutron's expertise in green hydrogen production and electrolysis technology will play a pivotal role in powering the EAF with clean energy. By leveraging its advanced AEM Electrolyser technology, Cipher Neutron aims to provide a reliable and efficient solution for generating green hydrogen, which will serve as a primary energy source for steel production processes.

The collaboration between Cipher Neutron and the Strategic Resources (Blackrock) project signifies a commitment to sustainability, innovation, and environmental stewardship within the steel industry. By replacing traditional fossil fuel-based energy sources with green hydrogen, the project aims to significantly reduce carbon emissions associated with steel production, contributing to global efforts to combat climate change. Through this collaborative effort, Cipher Neutron and the Strategic Resources (Blackrock) project are pioneering a new era of sustainable steel manufacturing, demonstrating the viability and scalability of green hydrogen as a clean energy solution for heavy industries. Together, they are driving forward the transition towards a greener, more resilient future, while fostering economic growth and job creation in the Saguenay region and beyond.

Some Noteworthy Projects

Molymet Mining Complex



This pioneering endeavor marks a significant milestone in the field of electrolysis technology, positioning Cipher Neutron at the forefront of innovation in green hydrogen production.

The contract award from Molymet, a leading supplier responsible for approximately 70% of the world's Rhenium supply, underscores the strategic partnership and collaborative efforts driving this ground-breaking initiative forward. By harnessing Rhenium as a catalyst in AEM Electrolysers, Cipher Neutron aims to unlock unparalleled efficiency, performance, and sustainability in green hydrogen generation processes.

Future R&D Of Cipher Neutron

1st company in the world to have Reversible Fuel Cell

Non-compressed hydrogen storage

Single system to produce green hydrogen and electricity

Ability to replace lithium-ion batteries

Patent pending



The RFC (Reversible Fuel Cell)

RFC Applications



Remote houses/cottages



Surplus power capture



Residential power backup



Power generation

Product Launch Timeline (Cipher Neutron Is Production Ready)



100-MEGAWATT Annual Capacity (10,000 Stacks of 10 kW)

Patents Filed

Successfully filed 5 patents. Many more under development.

Patent - Title	Status
Graphene Slurry Based Power Back Up System	Published, Patent Pending
Highly Efficient HT-PEM Fuel Cell Using Heat Pipe Based Cooling System	Published, Patent Pending
A Highly Efficient Polymer Acidic Electrolyte-based Reversible Fuel Cell With Serpentine Micro Flow	Published, Patent Pending
A Hybrid Solar Chimney With Wind Turbine Fore Hanced Efficiency	Published, Patent Pending
Highly Efficient Anion Exchange Membrane Electrolyser With Circular End Plates And Flow Channels	Published, Patent Pending

Key Success Factors

- Professionals at Cipher Neutron
- Commitment to protect all our intellectual property & competitive innovations by filing worldwide patents
- Collaborations with top universities
- Corporate reward programme for employee excellence in innovation
- Careful selection of priorities to deploy research and production funds effectively

Trademark Logo



Sales Projections

70 + Customers in discussion

Potential Revenue							
Product	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029</u>	<u>2030</u>
Stack	\$ 2,712,560	\$ 8,227,342	\$ 19,195,629	\$ 37,612,266	\$ 176,725,558	\$ 420,401,555	\$ 921,323,113
Electrolyser	\$ 4,212,860.18	\$ 16,433,639	\$ 43,387,692	\$ 100,851,659	\$ 296,128,718	\$ 577,361,936	\$ 329,831,983
RFC	\$ -	\$ -	\$ 1,266,432	\$ 8,941,971	\$ 32,611,344	\$ 65,515,107	\$ 618,473,162
Total	<u>\$ 6,925,420</u>	<u>\$ 32,590,798</u>	<u>\$ 63,849,754</u>	<u>\$ 147,405,896</u>	<u>\$ 505,465,620</u>	<u>\$ 1,063,278,598</u>	<u>\$ 1,869,628,258</u>

Our Management

"Great things in business are never done by one person; they're done by a team of people."
– Steve Jobs



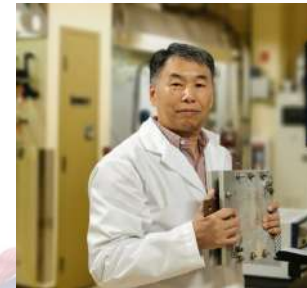
Gurjant Randhawa, M.Eng, P.Eng
Director, President and CEO
Hydrogen Experience: 10+ year



Dr. Bruno G. Pollet
Advisory Board
Hydrogen Experience: 30+ years



Jean Pierre Colin
Director, Corporate Secretary
Hydrogen Experience: 7+ year



Dr. Xianguo Li, P.hd
Advisory Board
Hydrogen Experience: 30+



Dr. Mayivelnathan, P.hd
Director, Business Development
Hydrogen Experience: 20+ year



Ranny Dhillon, M.Eng,
Director, Chief Scientific Officer
Hydrogen Experience: 8+ year



Dr. Larisa Karpenko, P.hd
Product Development
Hydrogen Experience: 20+ year



Dr. Amandeep Oberoi, P.hd
Head of Research & Development
Hydrogen Experience – 20+ years



Gurpreet Bhullar, M.Eng
Chief Technical Officer
Hydrogen Experience – 8+ years



Nancy Massicotte
VP, Corporate Development
Hydrogen Experience – 9 +

Cipher Neutron In The News

- 🌐 [Cipher Neutron Appoints Dr. Bruno Pollet to its Advisory Board](#)
- 🌐 [Cipher Neutron Receives Funding From Molymet](#)
- 🌐 [Cipher Neutron Receives Purchase Order From Molymet](#)
- 🌐 [Cipher Neutron provides 2023 Year End Update](#)
- 🌐 [Cipher Neutron and Western University gets funding from IESO 's Hydrogen Innovation Fund](#)
- 🌐 [Cipher Neutron and FuelPositive Forge Strategic Partnership for Multiple AEM Electrolyser Technology Orders](#)
- 🌐 [Cipher Neutron Signs Green Hydrogen Collaboration Agreement with Strategic Resources](#)
- 🌐 [Cipher Neutron and the Canadian University of Alberta Enter into Collaboration Discussions on Advanced Research in AEM Electrolyser Membrane Catalysts](#)
- 🌐 [Cipher Neutron Receives Initial Purchase Order from Kuber Group in Africa and Signs MOU to deploy 10 Megawatts of Capacity AEMs](#)
- 🌐 [Cipher Neutron Receives Purchase Order from Blade Hydrogen in Taiwan for its AEM Electrolysis Technology](#)
- 🌐 [Cipher Neutron Signs Collaboration Agreement with Ionormr to Create North America's First 250-Kilowatt AEM Hydrogen Electrolyzer](#)
- 🌐 [Cipher Neutron concludes Marketing Agreement with Technomak to supply AEM Electrolyzers](#)
- 🌐 [Cipher Neutron Appoints Dr. Xianguo Li to its AEM Hydrogen Electrolyser Advisory Board](#)
- 🌐 [dynaCERT and Cipher Neutron Catapult into the Hydrogen Economy Establishing an International R&D Facility in the Greater Toronto Metropolitan Area](#)
- 🌐 [Cipher Neutron enters Mining Industry with Molymet](#)





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