Cipher is an Arabic word for zero…
Hydrogen is the only element with zero neutrons…
Hence the name Cipher Neutron

Management Presentation

January 2025

Strictly Private & Confidential

Cipher Neutron

Cipher Neutron At a Glance

Formed to accelerate the global shift towards renewable energy, Cipher Neutron is a pioneering force in the clean energy transition dedicated to innovation and sustainability in green hydrogen production, power generation, and energy storage solutions

- Cipher Neutron leverages advanced technologies to develop Anion Exchange Membrane ("AEM") electrolysers for green hydrogen production and Reversible Fuel Cell ("RFC") technology for power generation and energy storage solutions
- Cipher Neutron's AEM electrolysers are highly efficient, iridium-free, and PFAS-free, offering a sustainable and cost-effective solution for green hydrogen production, meeting global targets while avoiding critical supply chain constraints
- The company's patent-pending RFCs use graphene slurry for non-compressed hydrogen storage, functioning both as a hydrogen generator and an energy storage solution—offering a sustainable alternative to traditional battery systems
- Cipher Neutron is scaling its production capabilities to meet growing global demand, with plans to increase production capacity from 100 MW to 600 MW of AEM electrolysers by 2025

North America's 1st

AEM Electrolyser Manufacturer

World's 1st Patent Pending

Reversible Fuel System with Graphene

2021
Year Founded

6
Patents Granted and Pending

600 MW
Targeted Annual Production Capacity(1)

1M+ tCO_2e
Annual Emissions to be Mitigated(2)

$100 M+
2027E Revenue

~25%
2027 EBITDA Margin

Corporate Partners

STRATEGIC RESOURCES · dynaCERT · FuelPositive · IONOMR INNOVATIONS · TECHNOMAK AUTOMATION & DIGITAL SOLUTIONS

Research Partners

SFU SIMON FRASER UNIVERSITY · UNIVERSITY OF ALBERTA · Western

Notes: All figures in C$ millions, unless otherwise specified.
1. Targeted annual capacity post capital raise.
2. Per 600 MW of AEM electrolyser capacity deployed.

Leadership Team

In attendance

Gurjant Randhawa, M.Eng, P.Eng

President & CEO

- Founded Cipher Neutron in 2021
- 10+ years of experience in hydrogen electrolysers and fuel cells; previously served as head of R&D at dynaCERT Inc.

Dr. Pierre Rivard

Director

- Founder and CEO of Hydrogenics (now Cummins).
- Council member of National Research Council, Canada.
- Executive Chairman and Co-Founder of TUGLIQ Energy Corp.

Ranny Dhillon, M.Eng

Chief Scientific Officer

- 10+ years of R&D experience in hydrogen electrolysers, fuel cells, and membrane electrode preparation techniques
- Co-invented 6+ international patents in hydrogen & fuel cell technology

Dr. Bruno Poller

Advisory Director

- 25+ years of management experience in Hydrogen Electrolysis companies.
- Strategy Advisor - Green Hydrogen Value Chain

Additional Members of Leadership Team

Jean-Pierre Colin
Director & Corporate Secretary

Dr. Mayilvelnathan
Head of Business Development

Dr. Amandeep Oberoi
Head of R&D

Dr. Xiaguo Li
Technical Advisor

Gurpreet Bhullar, M.Eng
Chief Technical Officer

Valuable Hydrogen Experience

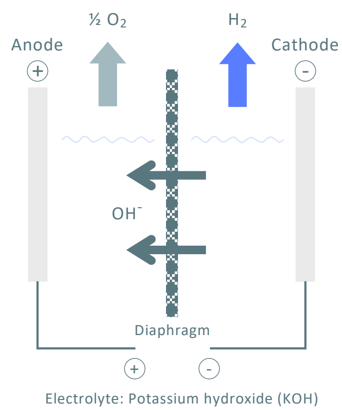
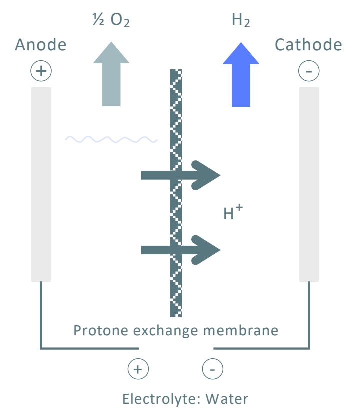
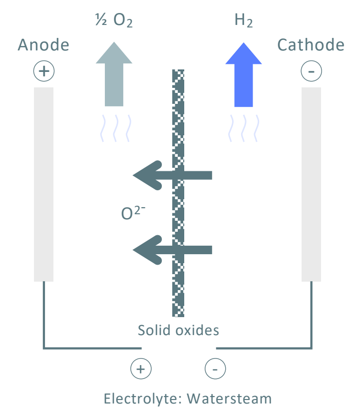
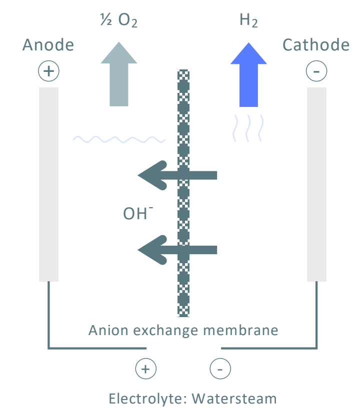
dynaCERT, TES Canada, Hydrogène Québec, IAGE, CHFCA, IHR UQTR, HYDROGENICS

200+ Years

Combined experience in hydrogen, clean technology, and business development

Electrolyser Innovations: Understanding AEL, PEM, SOEC, and AEM

AEM Offers a Unique Approach Towards Water Electrolysis

	Alkaline Electrolyser ("AEL")	Proton Exchange Membrane ("PEM") Electrolyser	Solid Oxide Electrolyser Cell ("SOEC")	AEM Electrolyser
Concept	*Uses a diaphragm to separate the anode and cathode*	*Deploys a membrane-based technology that allows protons to pass but blocks electrons*	*The solid electrolyte cell consists of ceramic material that separates anode and cathode*	*Uses an anion exchange membrane to separate the anode and cathode*
Structure				
Process	▪ At the cathode, electrons react with water, producing hydrogen (H_2) and hydroxyl ions (OH^-) ▪ The OH^- can pass the diaphragm, while H_2 leaves the cell at the cathode ▪ OH^- react at the anode and form oxygen (O_2) and water (H_2O), releasing electrons	▪ Water is supplied at the anode, where it is split into hydrogen protons (H^+) and O_2 ▪ The H^+ pass through the membrane to the cathode, and produce H_2 when H^+ reacts with electrons	▪ Water vapor is fed into the cathode and is reduced to form H_2 and oxygen ion (O^{2-}) ▪ H_2 leaves the cell at the cathode, the electrolyte enables the transport of O^{2-} to the anode ▪ At the anode, oxidation takes place and O^{2-} absorb electrons and to form O_2	▪ H_2O soaks the anion exchange membrane and migrates from the anode to the cathode, where it is split into H_2 and OH^- ▪ H_2 gas leaves the cell at the cathode, while OH^- pass through to the anode thereby resulting in water and oxygen when OH^- reacts with electrons
Technology Readiness	Matured	Commercialized	Demonstration	Demonstration[2]
Global Installed Capacity[1]	~65% *(oldest technology to date)*	~35%	<1%	<1%

Source: IEA, United States Department of Energy ("DOE"), and publicly available information.

1. Based on estimates from IEA as of 2023.
2. Only two participants, including Cipher Neutron, in the manufacturing of commercial AEM electrolysers.

Breaking Down Key Performance Indicators Across Electrolyser Technologies

High Efficiency and Low-Cost: AEM Electrolysers Offer Best of Both Worlds

Cipher Neutron

	Alkaline Electrolyser	PEM Electrolyser	Solid Oxide Electrolyser Cell	AEM Electrolyser
Efficiency (HHV values[1])	~65%	~80% - ~90%	~85%	**90%+** High efficiency, especially at low current densities (at 0.7 amps)
Current Density	0.2-0.5 A/cm^2	1.0-2.0 A/cm^2	0.3-1.0 A/cm^2	**1.0 – 2.0 A/cm^2**
Operating Temperature	60 - 80°C	50 - 80°C	700 - 1,000°C	**60 - 80°C**
Operating Pressure	30 bar	70 bar	1 - 25 bar	**30 bar**
Cost	OpEx: High (low pressure H_2 production) CapEx: Low (mature technology with low-cost materials)	OpEx: High (due to de-pressurization issues) CapEx: High (due to use of PGMs[2])	OpEx: High (due to higher operating temperatures) CapEx: High (due to use of REMs[2])	OpEx: **Low** (high pressure eliminates the need for secondary compressors) CapEx: **Low** (compact design requiring small footprint)
Material Usage & Supply Chain	Low supply chain constraints as they utilize abundant materials (nickel, steel, etc.) with some precious metals	Heavily depend on PGMs, thus leading to supply chain constraints as >80% PGMs are in South Africa	Dependent on REMs, leading to supply chain constraints as REMs are concentrated in few select countries	Locally sourced materials, resulting in **short lead times**
Environmental Impact	Low to moderate impact (use of caustic materials like KOH)	Higher environmental impact (PFAS[3] and precious metal usage)	High environmental impact due to high temperatures & materials used	**Lower environmental impact** (Iridium free and PFAS-free)
Durability	40,000 – 80,000 hours	30,000 – 60,000 hours	10,000 – 20,000 hours (Limited by high temperature)	**30,000 – 50,000 hours**
Lifespan	Longer life span with low maintenance	Short lifespan with high maintenance	Short lifespan with high maintenance	**Longer** life span with **low** maintenance
Start-up Time	Slow startup (Hours, depending on size)	Quick startup (Minutes)	Very slow startup (Hours to reach operating temp.)	**Quick startup** (Minutes)
Flexibility & Scalability	Less flexible, better for steady-state operations	Highly flexible, good for dynamic operations	Low flexibility, primarily suited for industrial-scale applications	**Highly flexible**, ideal for fluctuating renewable energy inputs
System Integration	Limited integration with fluctuating power sources	Excellent integration with renewable energy sources	Best integrated into industrial processes with high waste heat	**Excellent integration** with renewable energy sources

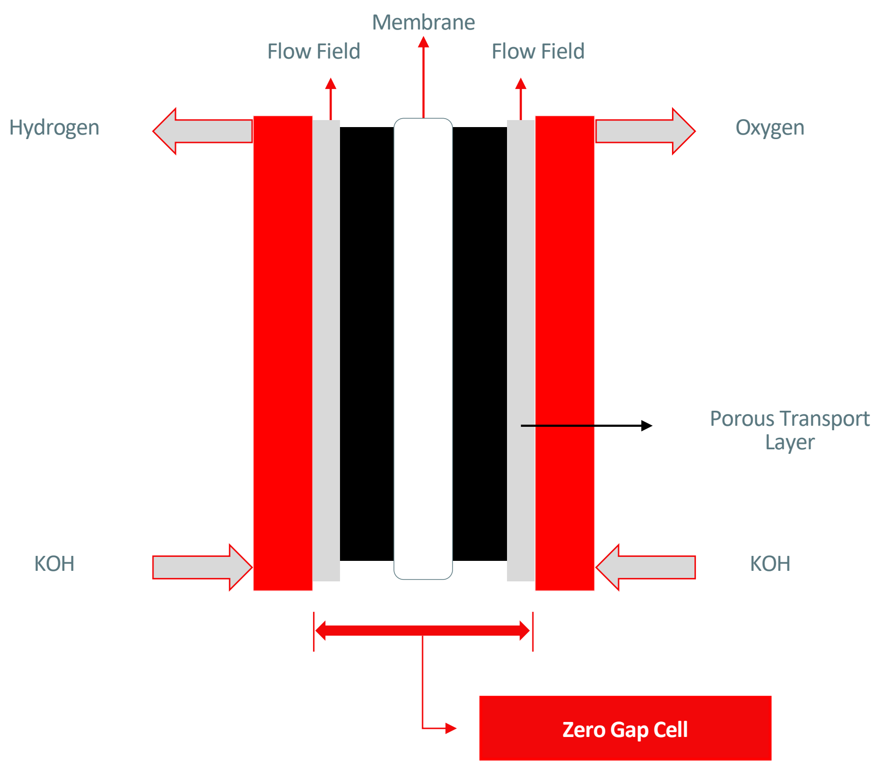
Source: IEA, United States Department of Energy ("DOE"), and publicly available information.

1. HHV refers to higher heating value.
2. PGMs refer to platinum group metals such as platinum, palladium, rhodium, ruthenium, iridium, and osmium, REMs refer to rare-earth metals such as zirconium, lanthanum, yttrium, and scandium.
3. PFAS refers to polyfluoroalkyl substances.

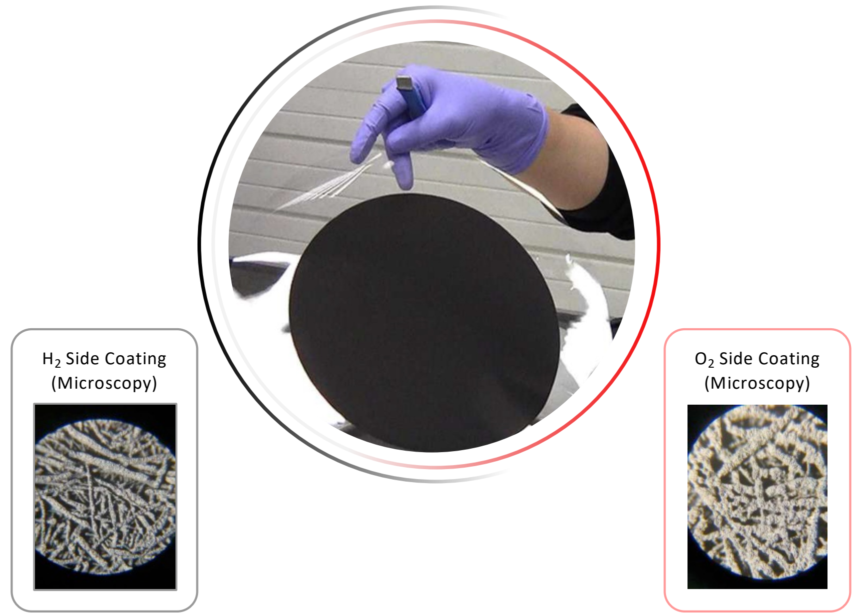
Cipher Neutron's AEM Technology Differentiation

Proprietary Technology and High-Quality Components Deliver Exceptional Performance

ZERO GAP CELL TECHNOLOGY



PROPRIETARY INK RECIPE AND COATING MECHANISM



Less than 0.45% degradation recorded per 1,000 hours, and less than 4% when extended on an annual basis

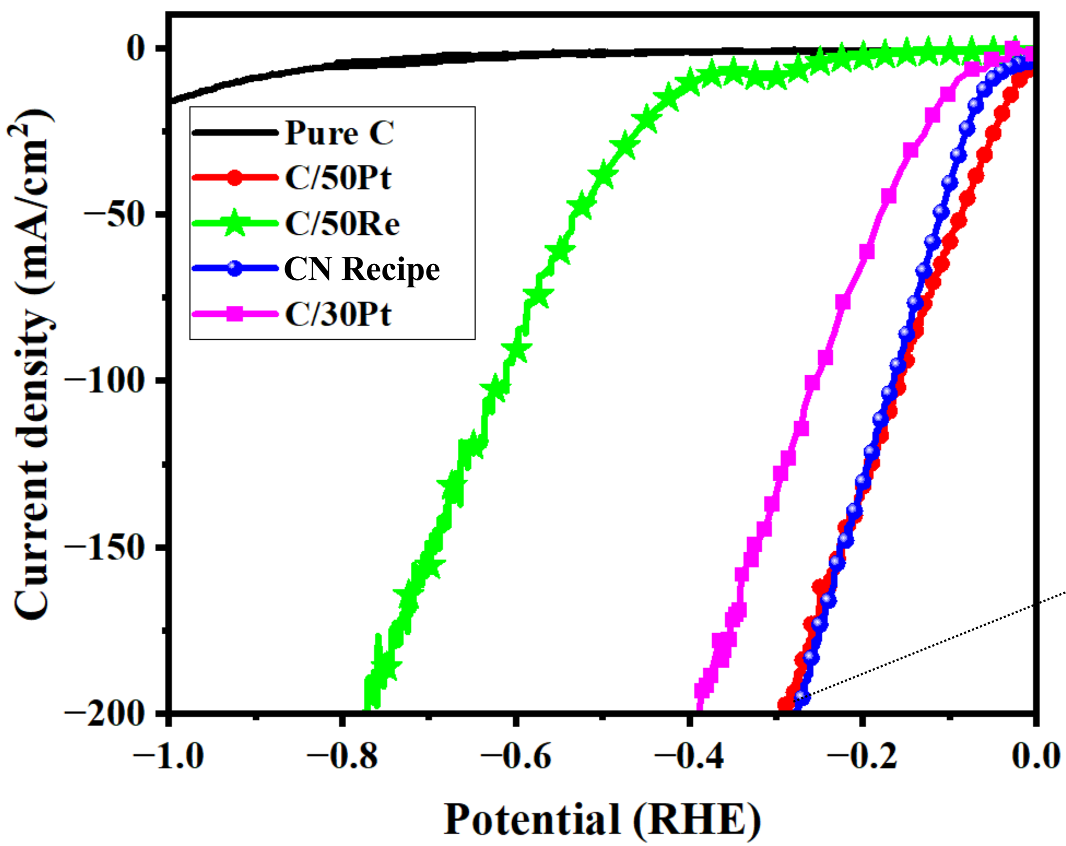
- **Enhanced Efficiency:** Reduced ion transfer resistance allows for more efficient ion conduction
- **Lower Ohmic Losses:** Shorter ion travel distance between anode and cathode improves cell performance
- **Enhanced Gas Separation:** Prevents gas mixing, improving safety and purity
- **Improved Durability:** Consistency in performance with minimized degradation

1. 3,300 hours of performance of AEM electrolyser at constant current density (600mA/cm^2 and 1100 mA/cm^2).

Cipher Neutron’s AEM Technology Differentiation

Proprietary Catalyst Recipe and Coating Method Delivers Exceptional Performance

ELECTROCHEMICAL DATA (ROTATING DISC ELECTRODE)



Catalyst Abbreviations:
Pure C = 100% Carbon
C/50Pt = 50% Carbon 50% Platinum
C/50Re = 50% Carbon 50% Rhenium
CN Recipe = Cipher Neutron Recipe
C/30Pt = 70% Carbon 30% Platinum

Equipment: WaveVortex 10
Conditions:
Electrolyte: 1 M KOH
Rotating Speed: 1600 rpm

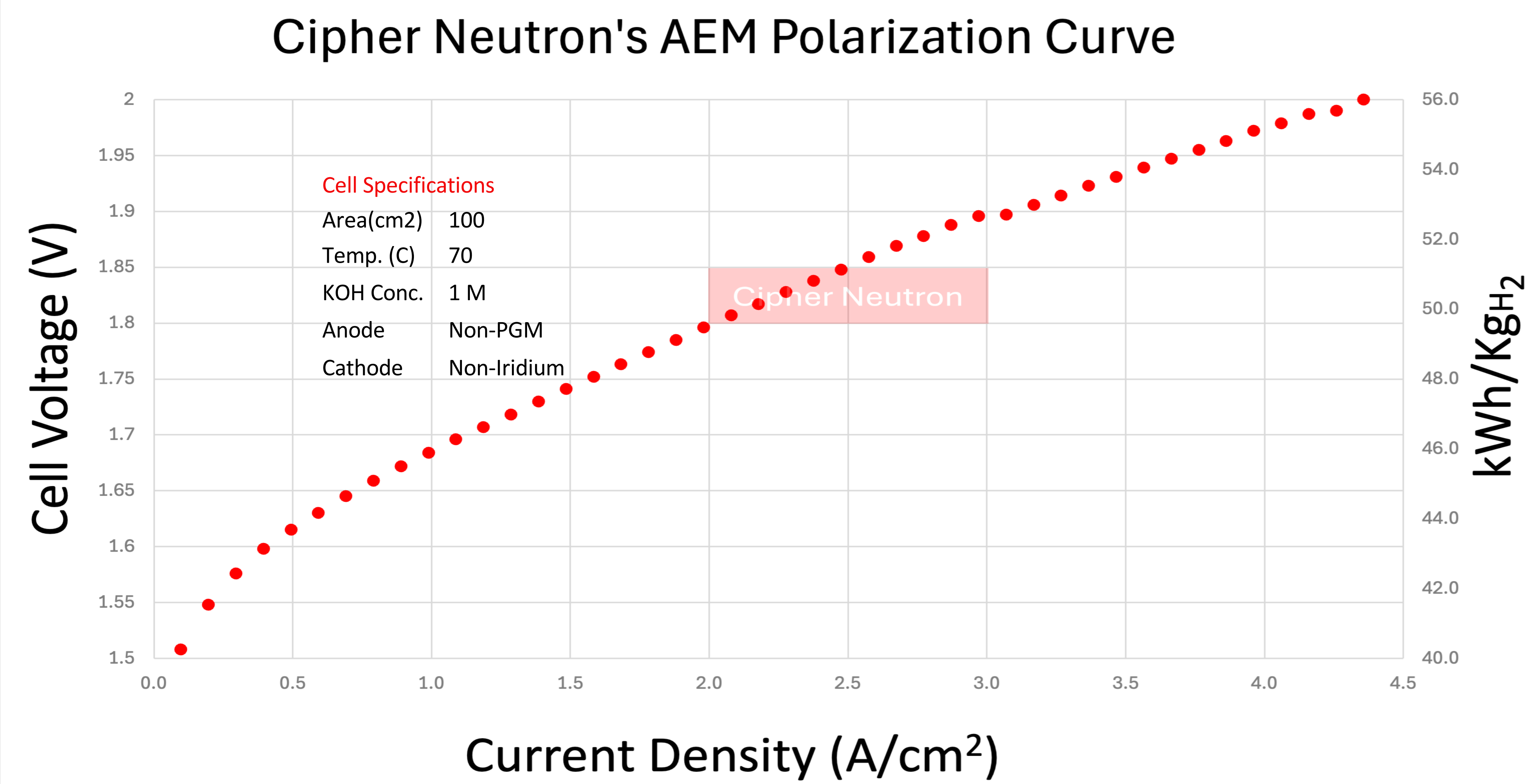
Lower Tafel Slope Indicates:

- **Higher Catalytic Activity**
- **Faster Reaction Kinetics**
- **Lower Overpotential**
- **Improved Stability**

Cipher Neutron’s Catalyst Recipe has shown better results than high end catalyst recipes available in the market

Cipher Neutron's Polarization Curve

Unrivaled Efficiency and Performance Across all Electrolyser Technologies



1A/cm2 @ 1.68 V/Cell | 2 A/cm2 @ 1.8 V/Cell | 4.3 A/cm2 @ 2 V/Cell

* 1000-hour data with less than 20 µV/hour of degradation

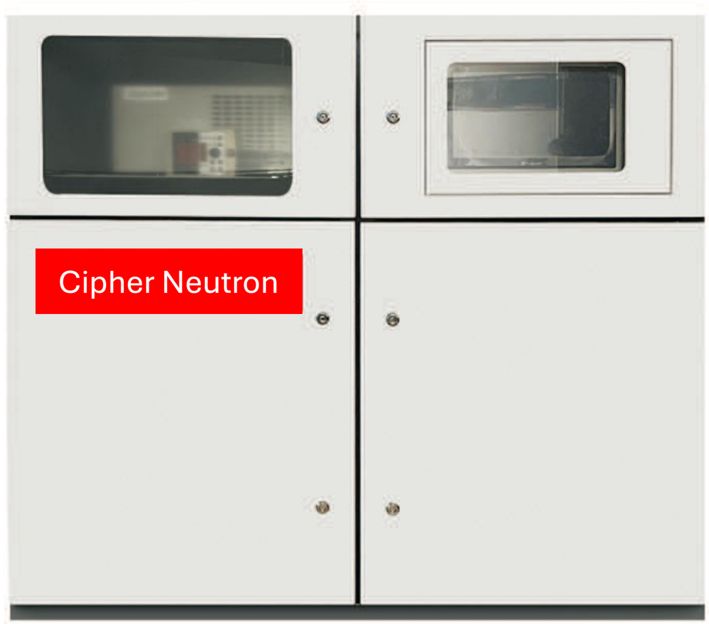
Developing North America's First AEM Electrolyser

Unrivaled Efficiency and Performance Across all Electrolyser Technologies

Durable

Affordable

Sustainable



Highly Efficient	Highly Ampacity	Highly Pressure
>90% stack efficiency versus industry standard of ~80% *(HHV values)*	High current density **(>1 amps/cm²)** enables more H_2 production per unit area	**Eliminates** the need for expensive **secondary compressors** up to 30 bars


Steel


Mining

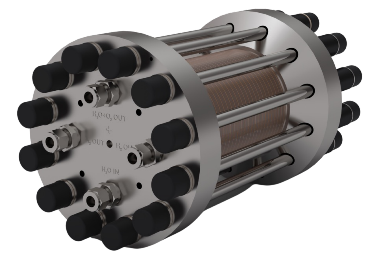

Chemical


Transportation


Oil & Gas

Why Electrolyser Efficiency Maters

Maximizing Output, Minimizing Costs: The Game-changing Impact of Superior Electrolyser Efficiency



	Cipher Neutron's Stack		**Traditional Stack**
Stack efficiency (based on HHV values)	90%		~80.00%
	Illustrative 100 MW Project		
Electrolyser stack capacity	100,000 kWh		100,000 kWh
Operating hours (at 100% capacity)	8,760	×	8,760
Energy consumption/kg H_2	43.78 kWh	÷	49.25 kWh
Annual H_2 production (metric tons)	20,022		17,786

13% Output Improvement

(Additional 2,236 MT of H_2)

Cipher Neutron's AEM Technology Delivers Consistent Performance and Reliability, from Pilot Projects to Large Industrial Applications, Making it Ideal for Scaling Hydrogen Production

Levelized Cost of Hydrogen (LCOH)

Cipher Neutron provides one of the most cost-effective solutions for hydrogen production.

LCOH provides a **standardized measure** of how much it costs to produce one unit (usually 1 kg) of hydrogen over the lifetime of an electrolyser project.

LCOH = ∑(I+M+E+O)/ ∑ H

- Where:
- **I** = Initial capital cost (CapEx)
- **M** = Annual maintenance and operation costs (OpEx)
- **E** = Electricity costs for hydrogen production
- **O** = Other operational expenses
- **H** = Annual hydrogen production (kg/year)

	Cipher Neutron's Electrolyser	Traditional Electrolyser
Initial capital cost (CapEx) for 1 MW	1,000,000	1,350,000 (1)
Average Annual maintenance/operation costs (OpEx)	3% of CAPEX	3% of CAPEX
Assumed Electricity costs for H_2 production	$ 0.05	$ 0.05
Annual hydrogen production (kg)	~160,000 (2)	~145,500 (3)
Average Electrolyser Lifetime	5 years	5 years
Levelized Cost of Hydrogen	$ 3.94 /kg	$ 4.81 /kg

Over 18% Improvement in LCOH

Note: All prices in CAD, unless mentioned otherwise.

1. Average 1 MW PEM Electrolyser Cost.
2. Annual H2 production based on 50 kwh to produce 1 kg of H2 and 8000 hours of yearly operation. This is the stack consumption plus all other auxiliaries in the Balance of Plant.
3. Annual H2 Production based on 55 kwh to produce 1 kg of H2 and 8000 hours of yearly operation. This is the stack consumption plus all other auxiliaries in the Balance of Plant.

Introducing the World’s First Patent-pending Reversible Fuel System

Innovative Solution with Graphene, Expected to Revolutionize Hydrogen Storage and Usage

- Dual-function system, produces green hydrogen (electrolyser) and generates clean electricity (fuel cell)
- Graphene slurry enables safe and efficient hydrogen storage, reducing risks associated with high-pressure systems
- Seamless integration into both large-scale industrial applications and smaller residential energy setups
- Superior energy density compared to conventional hydrogen storage, making it suitable for longer-term energy storage
- Non-compressed hydrogen storage enhances safety, addressing key concerns in hydrogen infrastructure development

Targeted for Launch in Q4 2026

Clean Energy Storage

Residential Backup Power

Remote Dwellings & Communities

Cipher Neutron is Production Ready

With Plans in Place to Increase Capacity 6x to Capture Future Demand

CURRENT FACILITY

- 100 MW annual AEM electrolyser production capacity
- Semi-automated production line
- Scalable manufacturing facility in Toronto, Ontario
- Dedicated R&D facility driving innovation
- Production ready and operational today!

PLANNED FACILITY

- Capacity increase of 6x to 600 MW annually
- State-of-the-art tools and machinery
- Highly scalable facility designed for flexibility across project sizes
- Easy access to logistics and distribution infrastructure and proximity to global supply chain infrastructure
- Capable to produce non-standard, custom-designed items essential for AEM electrolyser production

Some Noteworthy Projects

Successful Installs and Ongoing Projects

Green Ammonia Project, Ontario, Canada

This project is to produce Green Ammonia, a fertilizer for the farms. Cipher Neutron has provided electrolysers stack for this project.

Green Steel Project, Quebec, Canada

This project is to replace Natural Gas, in the Electric Arc Furnace, with Green Hydrogen. Project is under development.

University of Western Ontario, Canada

This project is to produce Green Hydrogen using floating and traditional solar panels. Cipher Neutron provided 5 kW electrolysers for this project.

Metal Reduction, Project, Chile

This project is to produce Green Hydrogen for a Chilean mining process company for their metal reduction process. Cipher Neutron has delivered one system and now is working on another project with the same company.

Recent Partnership

Building Out SFU's Clean Hydrogen Hub

- In July 2024, Cipher Neutron was awarded an advanced contract award notification to design and construct 2 electrolyser stacks with a capacity of 250 kW for Simon Fraser University ("SFU")
- The project is expected to begin in Q4 2024
- The project will investigate and validate the AEM technology at the 250 kW - 1 MW scale
- As part of the partnership, Cipher Neutron and SFU intend to explore advanced AEM electrolyser technologies to enable scaling of low-cost green hydrogen production

"As a leading research university and trusted innovation partner, Simon Fraser University is excited to collaborate with Cipher Neutron to advance the scalability of AEM electrolysers with this innovative 250 kW single-stack project. This initiative will help us advance the Canadian innovation ecosystem while developing the capacity needed to reach net-zero target"

- Laura Sloboda, Operations Director, Clean Hydrogen Hub of SFU

Disclaimer

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