

Kirill S - Questions October, 2 2024

1. How much uncertainty is still there with respect to the cost of the system?

The system consists of two main parts:

1. Balance of Plant (BoP)
2. Fuel Cell (FC) Stack.

1. The BOP

The BoP is assembled from off-the-shelf components that are well-known in terms of performance and cost. These components are widely represented on the market (like compressors, fans, pumps, pipes, etc.). So, we are confident in the price of these components, which were confirmed by suppliers with invoices at our request.

2. The FC Stack.

We are familiar with the stack design and its components from my previous HyPoint project (HTPEM Fuel Cell for hydrogen aircrafts). The cost of the main elements, such as bipolar plates and membrane-electrode assembly, is confirmed by references and offers from suppliers such as BASF and Elcon Precision, considering the scale manufacturing capacity. All values are conservative and consider only the current manufacturing technology level.

It is also worth noting that our estimate includes not only hardware components but also labor assembly costs. We have worked out the BOM of our product in detail and are confident in the accuracy of our cost estimate.

2. If I understood correctly, the plan initially (MVP) is to provide the system with a separate electrolyzer / fuel cell module. Which electrolyses / FCs are you using for it? What are the economics for those?

Correct. These are Enapter Electrolyzer and Plug Power Fuel Cell in our MVP. The economics is not great, and that wasn't our goal to be cost-efficient. The aim of our MVP (Minimum Viable Product) is to demonstrate and validate our system design, which is critical for moving our technology forward. The MVP will be a smaller version of our "power plant in a box" designed to support level-two chargers at this stage. The plan is to integrate our proprietary high-temperature fuel cell and

electrolyzer into the system after validation and prototype testing instead of current technologies, ultimately leading to a fully integrated reversible fuel cell system. This step-by-step approach ensures that we can showcase our capabilities and expertise, attract potential customers, and secure further investment.

3. Why is not everyone using HTPEM fuel cells? Are there any other issues, e.g. reliability?

The main reason that we have not seen wider deployment of HTPEM fuel cells is that HTPEM technology was developed ~20 years after LTPEM and so LTPEM has a significant head start in market penetration, while HTPEM is still getting through the last stages of technology development. On the plus side, HTPEM offers significant opportunities for improvement (it's only at ~60% of potential maximum performance) while LTPEM is more or less maxed out in terms of performance and what we are doing at HyWatts is a critical piece of this improvement.

Advantages of HTPEM over LTPEM:

- Reduced Cost
- No use of Fluorocarbons
- No weather/temperature limitations on operation

Because HTPEM is earlier in its development life-cycle, one of the challenges that has needed to be overcome is performance (particularly in terms of leakage) but we have already seen significant improvements over the last 15 years (see below) and there is further room for improvement.

PBI-Membrane Development

Parameter	2004	2008	2016	2021
Power (Max, W/cm ²)	~ 0.4	~ 0.4	0.62	0.9+
Thickness (μ m)	475	400	375	140
Durability (at 160 C)	20 μ V/hr ~ 1,000 hr	< 6 μ V/hr +15,000 hr	< 4 μ V/hr +15,000 hr	~ 0.5 μ V/hr +20,000 hr
Mechanical Prop's Compression Creep (x 10 ⁴ Pa ⁻¹)	-	-	10	2

HTPEM represents a critical path into the future for hydrogen and HyWatts is at the forefront of that effort. We are already starting to see significant growth in HTPEM research and commercial deployment globally. Currently South Korea, Germany, France, & the US are leading the way in research with businesses such as BASF, Airbus, Piasecki, ZeroAvia, BlueWorld, Advent, Safran, GKN Aerospace, and others already making significant investments into the technology.

4. Do you have your company's financial projections & funding needs?

For the commercialization of our full RFC by 2028, we estimate a total capital requirement of about \$50M, with staged funding rounds planned through 2028.

Please check our Q8 operation plan here – [LINK](#).

5. Can you talk about how you see market potential? Also, how you determined potential contract value that is mentioned in the presentation?

We see significant market potential in several key areas. Initially, we are focusing on the zero-emission vehicle (ZEV) charging sector, particularly for heavy-duty trucks. This will be followed by expansion into warehouses, community microgrids, data centers, and eventually utility-scale storage. Our technology is well-suited for these applications, and the utility-scale storage market alone is expected to grow to \$1.5 trillion by 2035.

We also completed the market analysis initially to understand the market opportunities. Please check here - [LINK](#). Also, see below for supportive content.

It is projected that there will be 1M Zero Emission medium and heavy duty on the road by 2030, requiring 700,00 chargers – which will require \$20B-\$30B in capital expenditures on construction costs alone. This demand is being driven both by industry, as seen in the investments in autonomous zero emissions trucks and charging infrastructure, as well as by the public sector. In particular, the US Government's National Zero-Emission Freight Corridor Strategy and new EPA Mileage Standards driving charging corridor development along critical transportation routes. These charging corridors also play a critical role in the government goal of 500,000 public chargers by 2030 and the \$5B in capital being deployed through the National Electric Vehicle Infrastructure program to support it.

Commented [A11]: [@Sam Ruben](#) Sam, I think you a few times made an excellent responses, including a lot of links and etc. Can you please work on the response?

[“The Total Addressable Market \(TAM\) for Heavy-Duty Electric Vehicle Charging Infrastructure was valued at USD 2.45 billion in 2022. It is projected to reach USD 37.10 billion by 2031.”](#) This is being driven by increased ZEV production commitments and ongoing conversion of existing MDHD production facilities: [“At least 278 fleets have made investment commitments to electrify MDHD vehicles. This includes 81 state and municipal fleets and 197 private fleets, including Amazon, Anheuser-Busch, and Sysco...”](#) While class 2b cargo vans have a significant lead, class 7 and 8 vehicle electrification commitments grew by more than 250 percent from 2021 to 2023.” [“The top five HD vehicle manufacturers in the U.S., which account for over 85 percent of domestic production capacity, have all announced plans to recalibrate their existing facilities to produce HD ZEVs:](#)

[Ford Motor Company is investing more than \\$50 billion in the transition to EVs including \\$1.5 billion to launch an all-new commercial EV at its Ohio Assembly Plant by mid-decade.](#)

[Paccar has added ZEV production lines at two of its three production facilities in the U.S. with an estimated collective capacity of over 40,000 trucks.](#)

[Daimler Truck launched series production of its flagship Freightliner eCascadia and eM2 at its plant in Portland, Oregon.](#)

[Volvo Group’s Volvo Trucks upgraded its New River Valley Plant to produce electric trucks alongside diesel vehicles.](#)

[Navistar \(TRATON Group\) opened a new manufacturing facility in San Antonio Texas with an annual capacity of 13,000 trucks specifically dedicated to producing diesel and electric trucks side by side.](#)

[The flexibility of these recalibrated facilities enables manufacturers to easily scale ZEV production to meet growing demand.”](#)

To support this growth in the number of ZEV MDHD trucks on the road we are already seeing deployment of MDHD charging infrastructure in remote areas along critical freight corridors. This includes stations from [Greenlane](#) (joint Daimler, BlackRock, NextEra venture) - along Interstate 15 from LA to Los Vegas; [Terawatt](#) – along Interstate 8 across the southwest; [WattEV](#) along CA-99, Interstate 5, and Interstate 10; as well as with [major truck stop players](#) such as [Pilot/Flying J, Love’s,](#)

[TravelCenters of America](#), and others (i.e. [BP](#)) installing EV capacity and additional amenities. It was this growth that led us to identify charging stations for Heavy Duty trucks as a viable initial market that will allow us to capture significant revenue in addition to proving the technology to allow us to move into other markets such as Data Centers and Utility Scale Storage.