

Implementation of the Hyperloop in the U.A.E.

Eilin Rachid-57182 (CVE)

Ahmad Hamdan-60623 (ELE)

Mina Elias-53195 (MCE)

Lama Al Ajaji-50257 (INE)

Taher Arafa-56702 (CVE)

Situation

The rapid increase in the UAE population has increased the need of transportation which results in Carbon dioxide (CO₂) emissions [3]. Therefore, this may lead to devastating results if there was no transportation system that could contribute in decreasing the CO₂ emissions. Therefore, the implementation of the Hyperloop could be a solution in resolving such a problem, which was envisioned by Elon Musk

What is a Hyperloop?

It is a fast transportation system that can go up to 1220 kph which uses solar energy that makes it produce the power needed to allow it to be self-sufficient system and it is eco-friendly [1]

Problems

Hyperloop Challenges:

Natural disasters

1. Geological disaster
 - Displacements may occur due to the presence of earthquakes and that may cause severe damage to the Hyperloop's structure [1]
2. Meteorological disasters
 - Damages may be caused to the infrastructure due to volumetric expansion from heat waves [5]

Solar panels energy efficiency

- Present time solar panels do not have enough energy efficiency to power up a complex structure such as the hyperloop [2]

Kantrowitz limit

- Application of a force that opposes the capsule that resides inside of the Hyperloop's tube which will slow-down the capsule
- Activation of the Hyperloop may not occur with the current solar panels

Safety

- In the case of depressurization of the capsule [1]
- In the case of Power Outage in the system [1]

Solution

Natural Disasters

- Addition of pylons and dampers will make the Hyperloop withstand thermal expansions and also make it not fixed to allow deviations[1] (see Figure. 1)

Solar panels energy efficiency

- Solar panels across the tube's length providing power to the system
- Excess power will be stored in batteries for full function at night [6] (See Figure 2)

Kantrowitz Limit

- Addition of a turbine to the front of the hyperloop (See Figure 3)

Safety Solutions

- Oxygen masks for passengers in the case of capsule depressurization [1]
- The usage of backup lithium battery in case of emergency [1]



Figure 1: A Depiction of the Pylons [1]

Figure 2: Cross Section of Rotor Inside Stator [1]

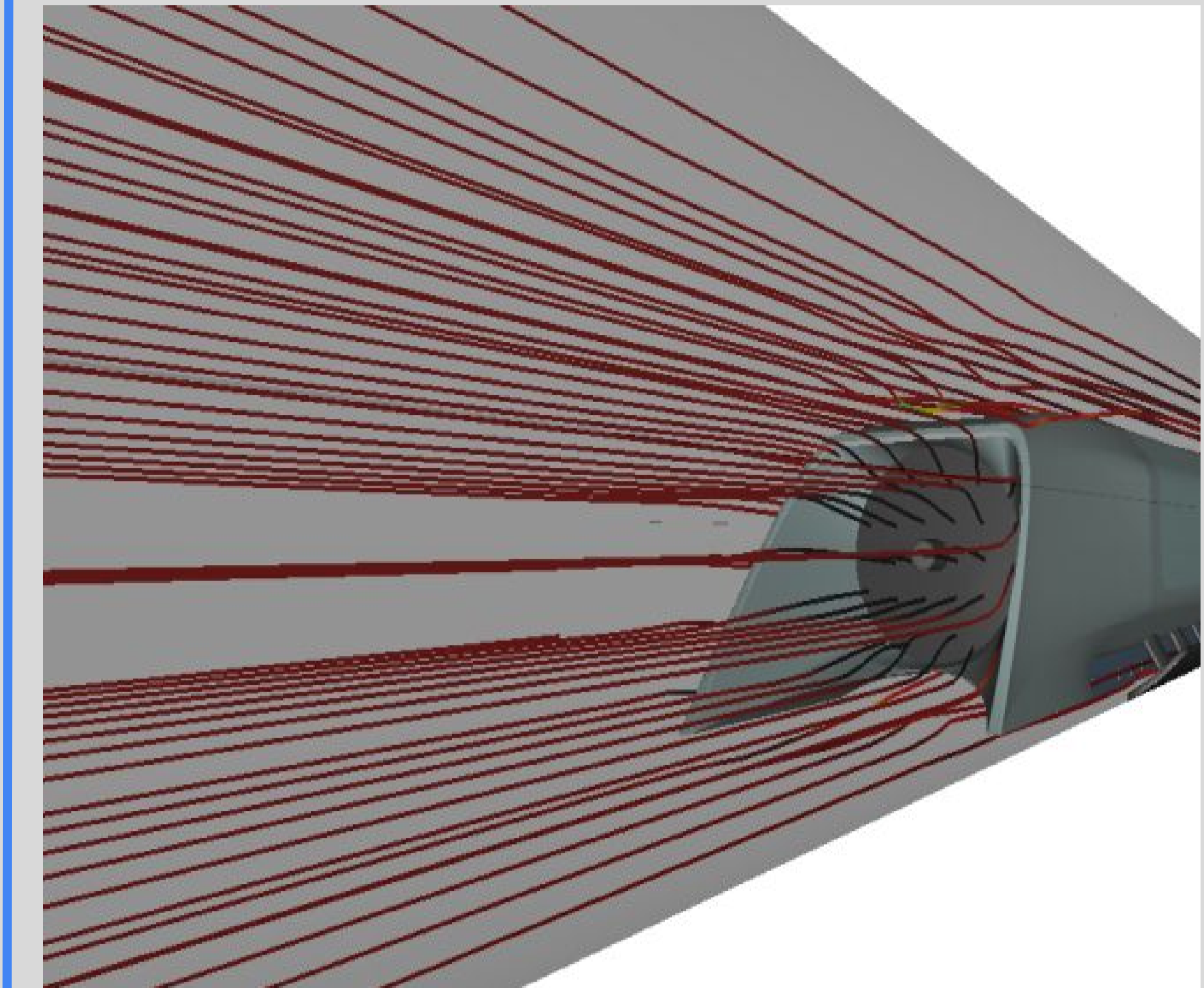
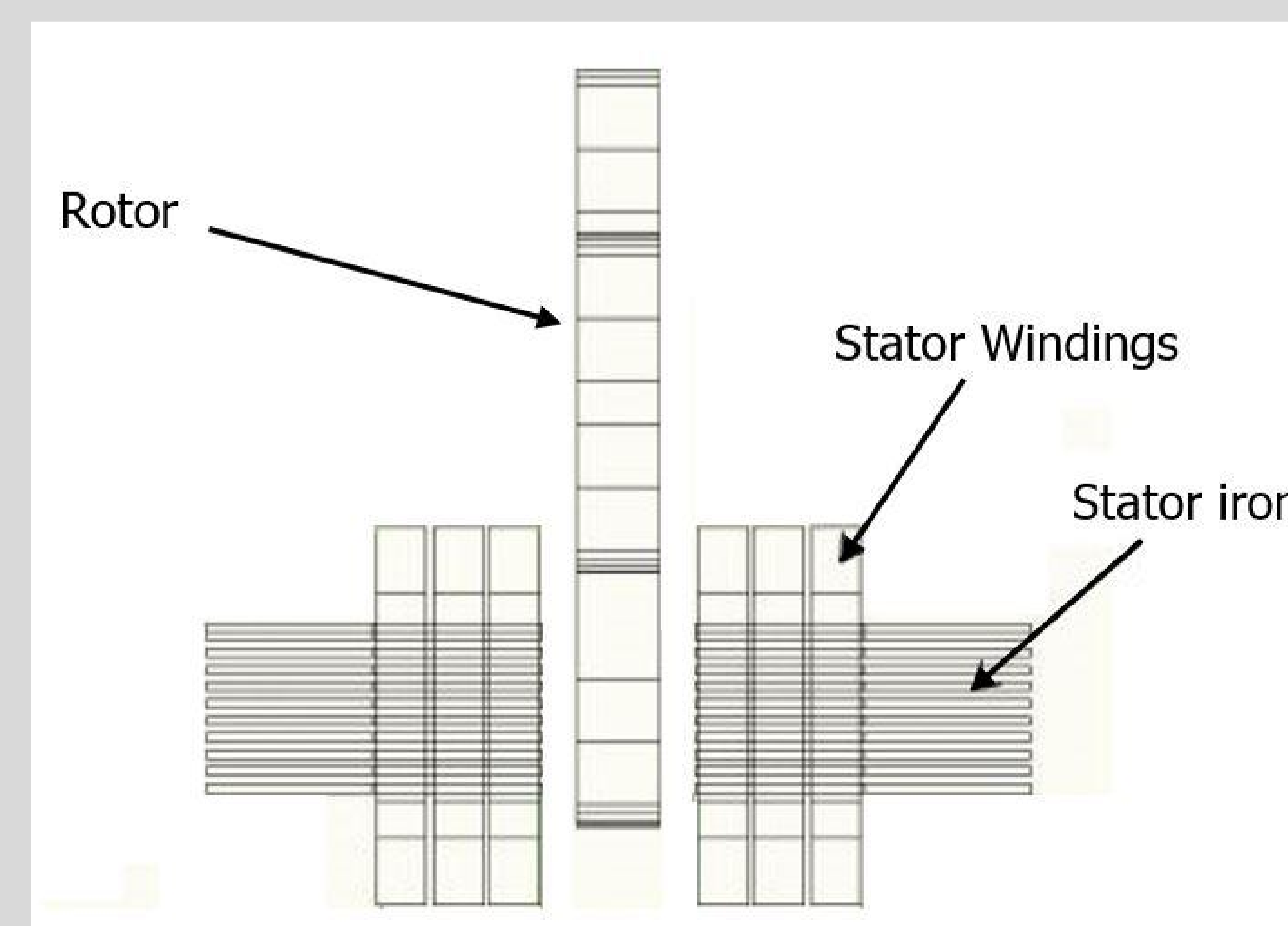


Figure 3: Kantrowitz limit-Streamlines [1]

Evaluation

- Initial costs are high but in the long run the benefits will outcome the costs and profits will cover the cost of the building in few years
- Estimate cost of two tubes with 40 capsules and is 6 Billion [4]
- Sponsors willingness to contribute in funding the project
- Major differences between the Hyperloop and the Metro Dubai system
- Hyperloop can move at high speeds between the Emirates
- Under High speed movment Still Provides comfort for passengers
- Reduces traffic and pressure on roads and highways.
- Self sufficient so has almost zero CO₂ emissions [4]

References

- [1] E. Musk, "Hyperloop Alpha", August 2013.
- [2] M. Rahman and S. Alam, "Performance Comparison of Mirror Reflected Solar Panel with Tracking and Cooling", 2016.
- [3] A. Al-khoury, "Population Growth and Government Modernisation Efforts", pp. 1-8, 2013.
- [4] D.Zhou, "Study on Model based Hazard Identification for the Hyperloop System" pp.26-31,2015
- [5] "Hyperloop: The 1200 Km/H "Train". BMW Welcomes.". *YouTube*. N.p., 2016. Web. 13 Nov. 2016.
- [6] Osman, Ahmad. Propulsion System. 2016. in person.
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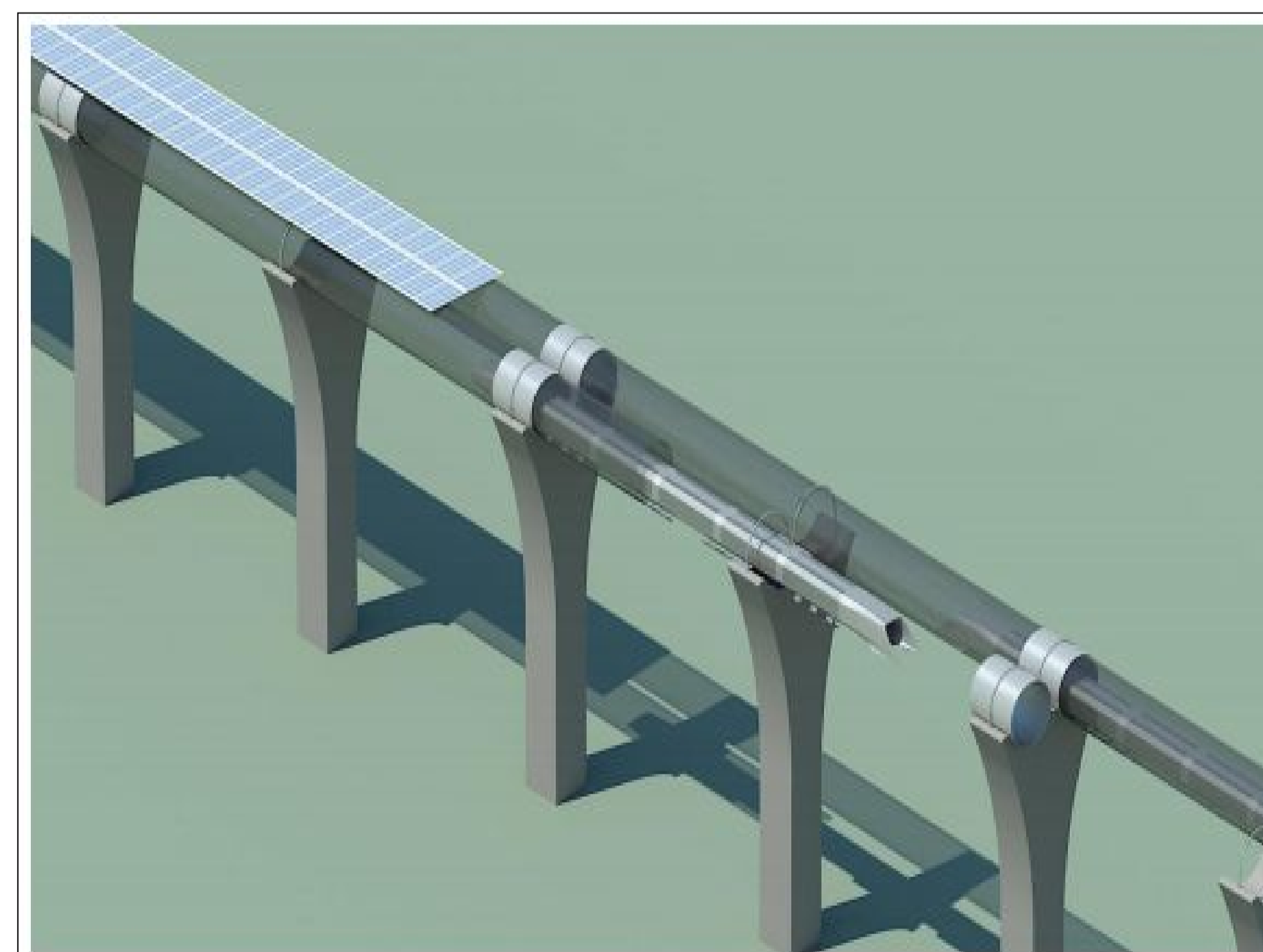


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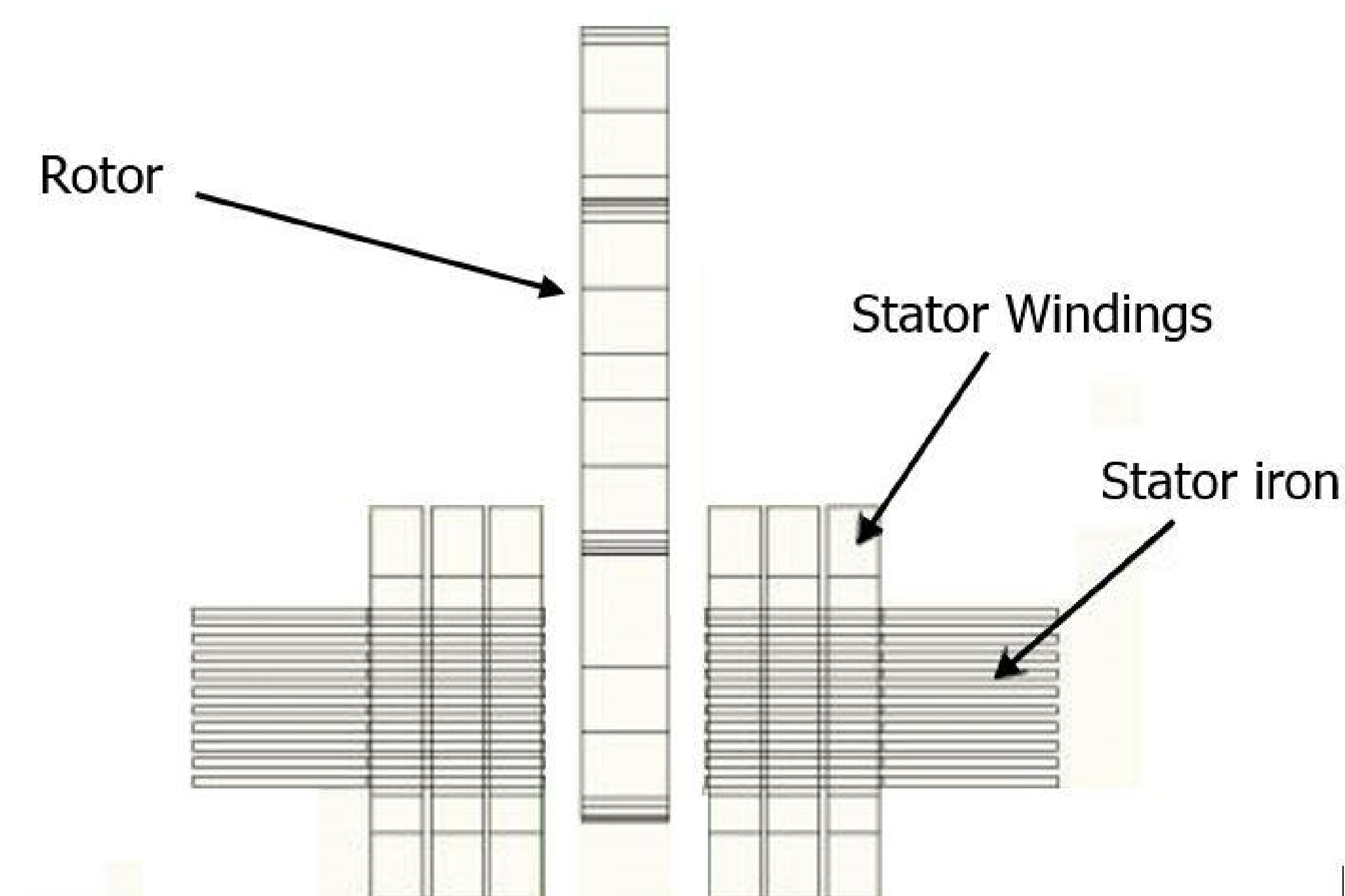


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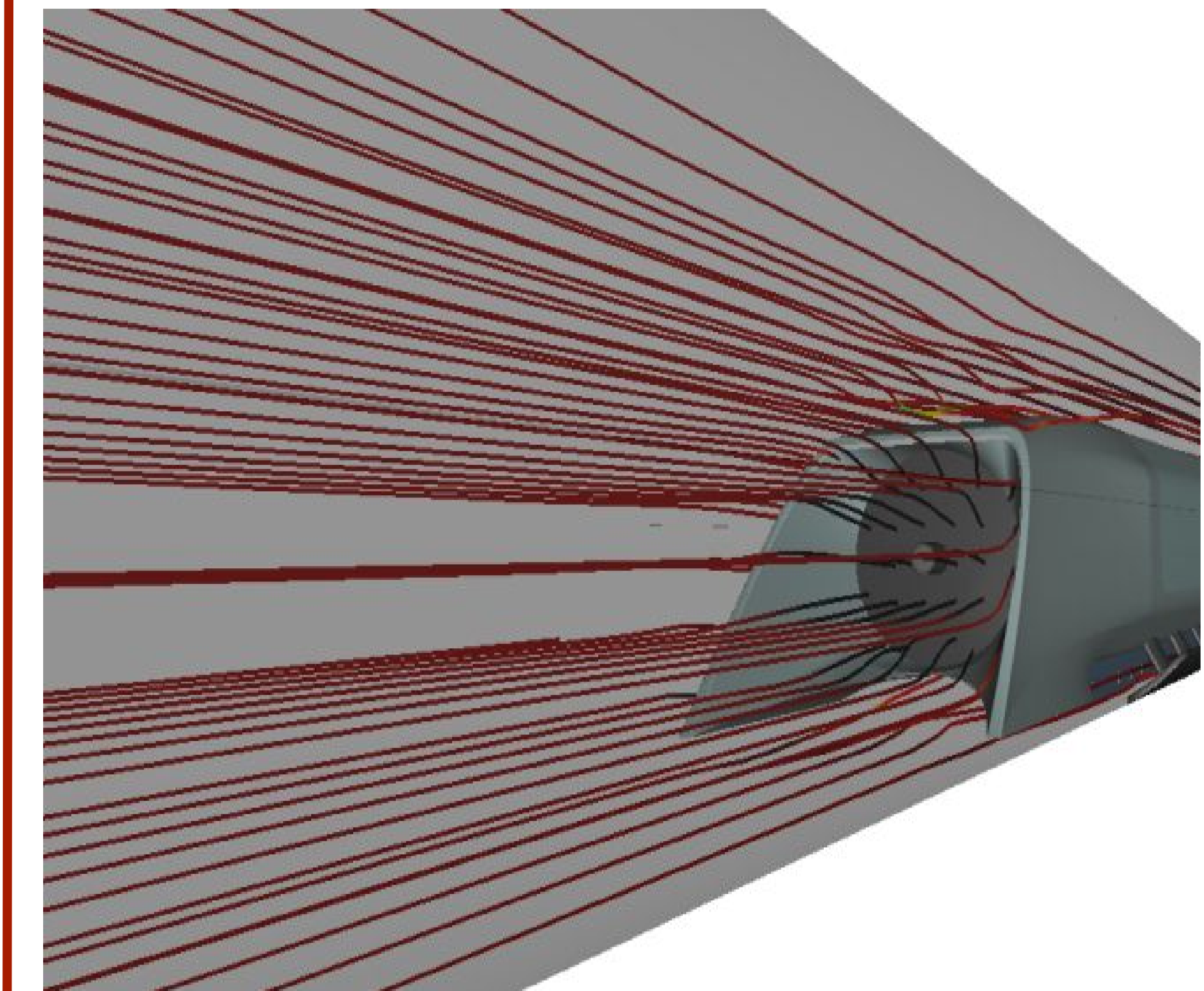


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