

Prospects for low-carbon hydrogen

Shi Chen, Carnegie Science

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Tokyo, Japan

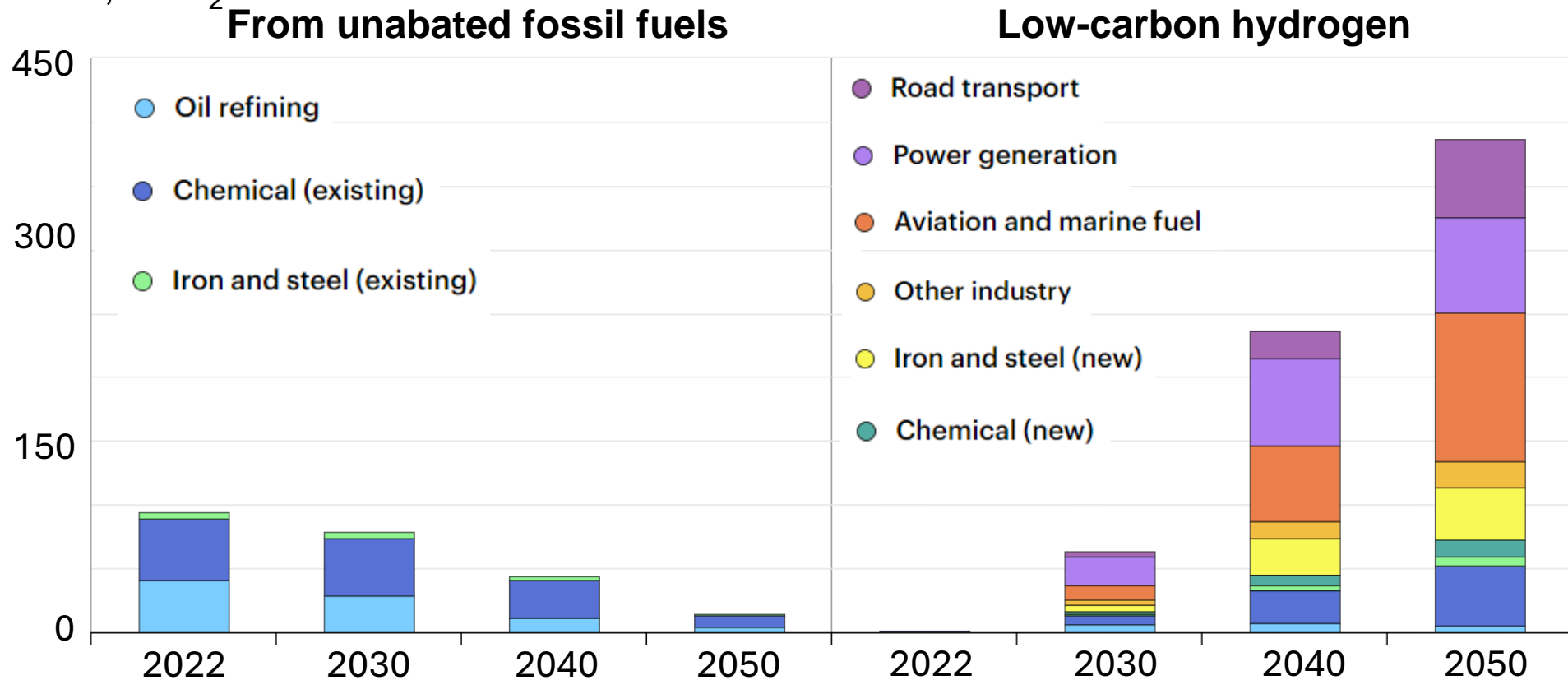


Key points

1. Low-carbon hydrogen can support a net-zero-emissions transition, especially in hard-to-abate sectors.
2. Low-carbon hydrogen is in its infancy; massive investment may be needed to reduce costs in both hydrogen technologies and upstream electricity.
3. Global cooperation can help
 - address mismatches between supply and demand, and
 - manage material requirements.

Globally, low-carbon hydrogen is expected to play an increasing role in hard-to-abate sectors

Global demand, Mt H₂



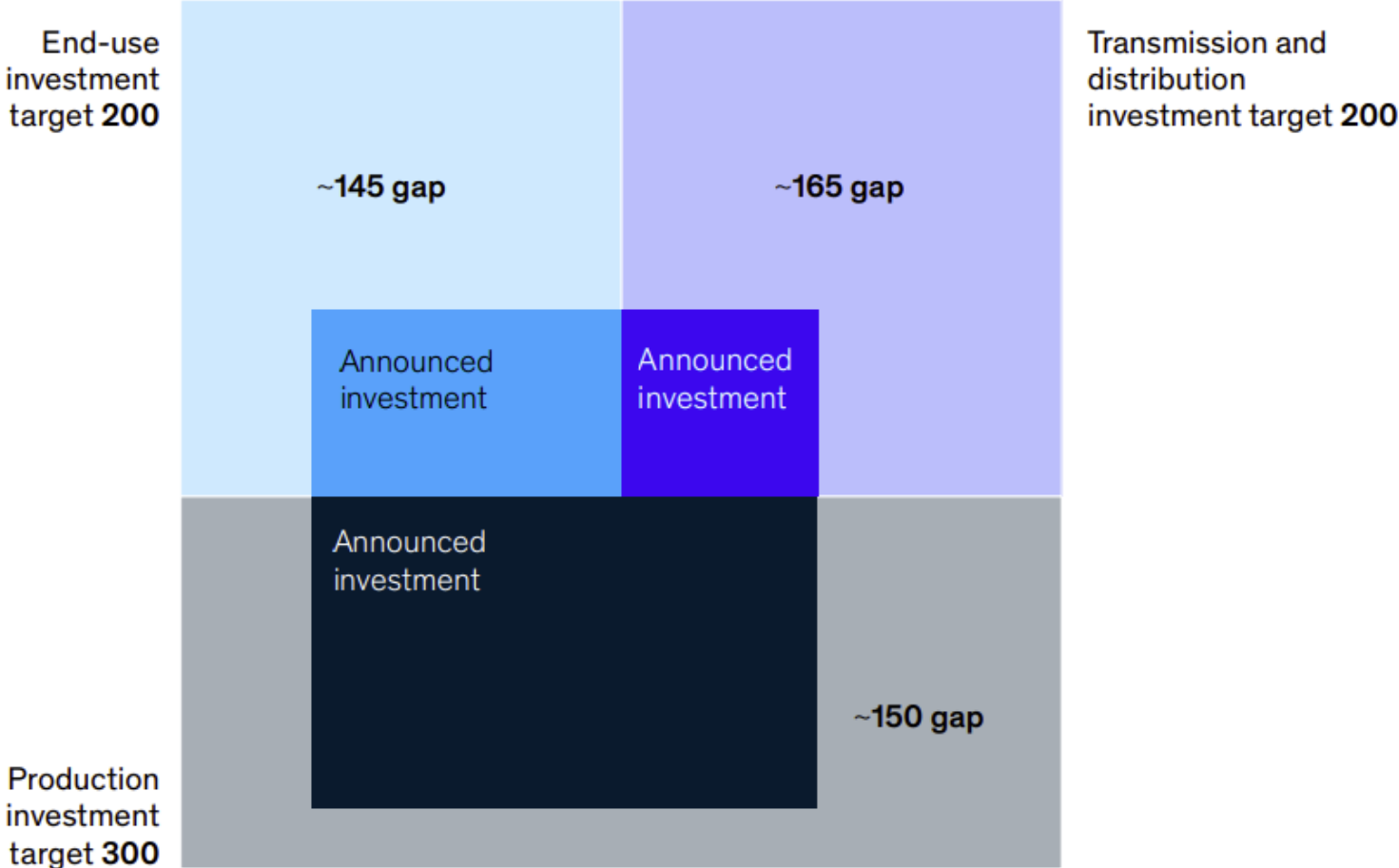
Source: IEA, 2023

Supply side: From fossil-fuel based hydrogen to renewable-based hydrogen

Demand side: From material to material and energy carrier

Incentives and investment are needed in hydrogen supply chain

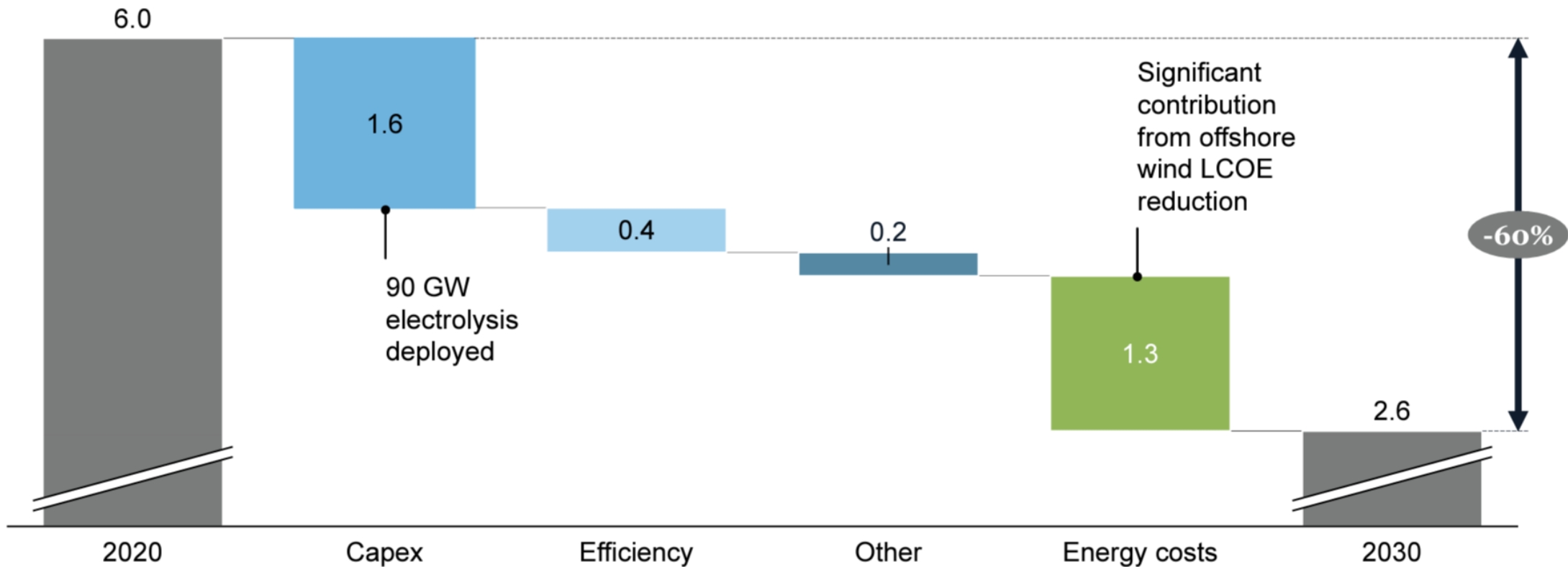
Announced and required direct investments into hydrogen until 2030 (\$ billion)



Source: Hydrogen Council, McKinsey & Company, 2022

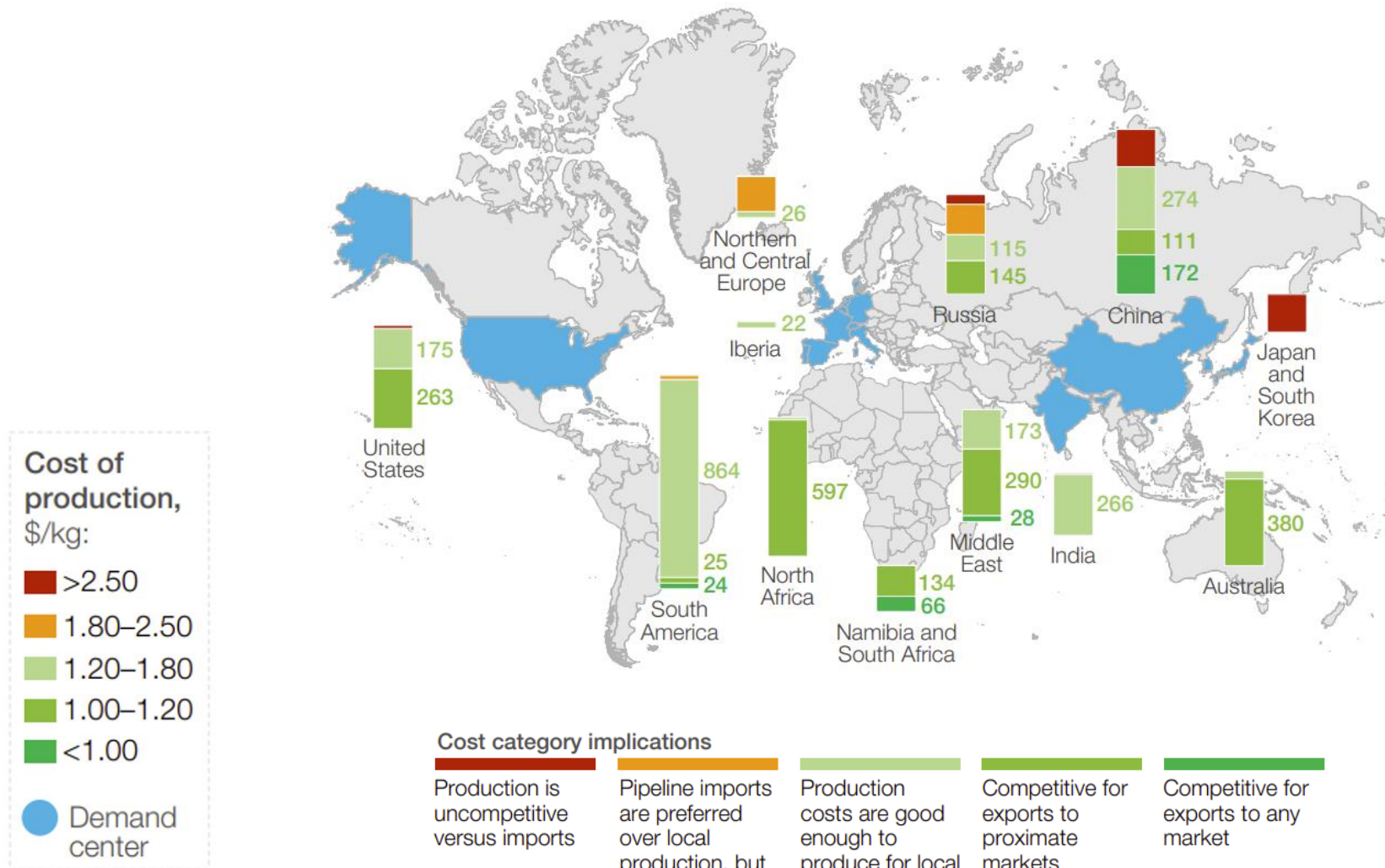
Electrolyzer and energy costs likely to be key drivers of low-carbon hydrogen cost declines

USD/kg hydrogen

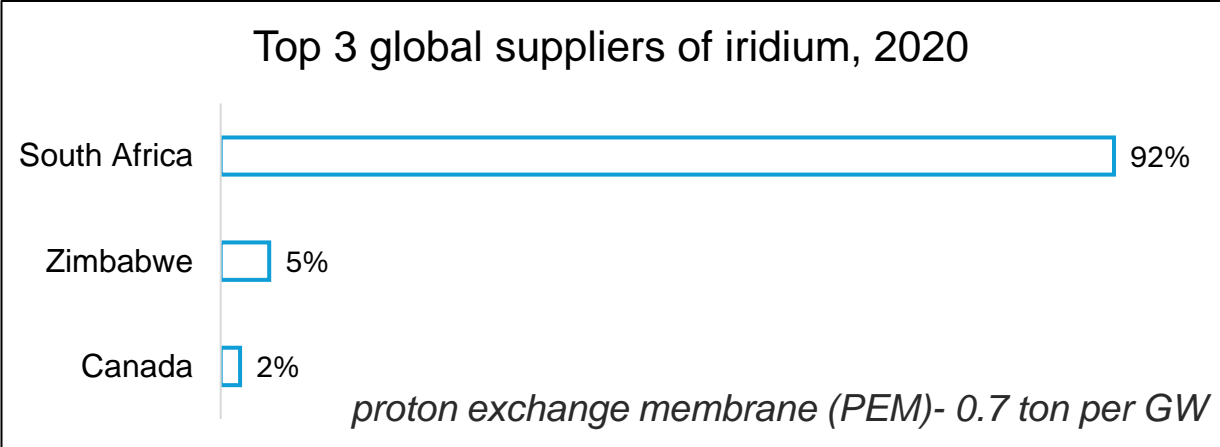
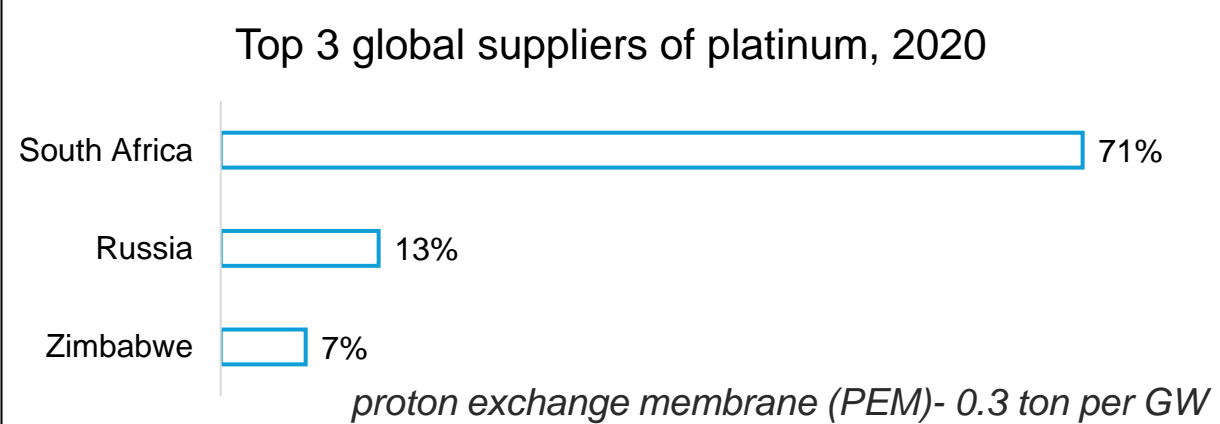


Source: Hydrogen Council, 2020

Demand-supply mismatch of low-carbon hydrogen



Key materials for electrolyzer and fuel cells are geographically concentrated



Source: SWP, 2022; Breakthrough Institute, 2024

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Thank you

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