Leipzig Hydrogen Value Chain for Europe

LHyVE – Hydrogen in Practice

Integrated Hydrogen Value Chain for Efficient Sector Coupling

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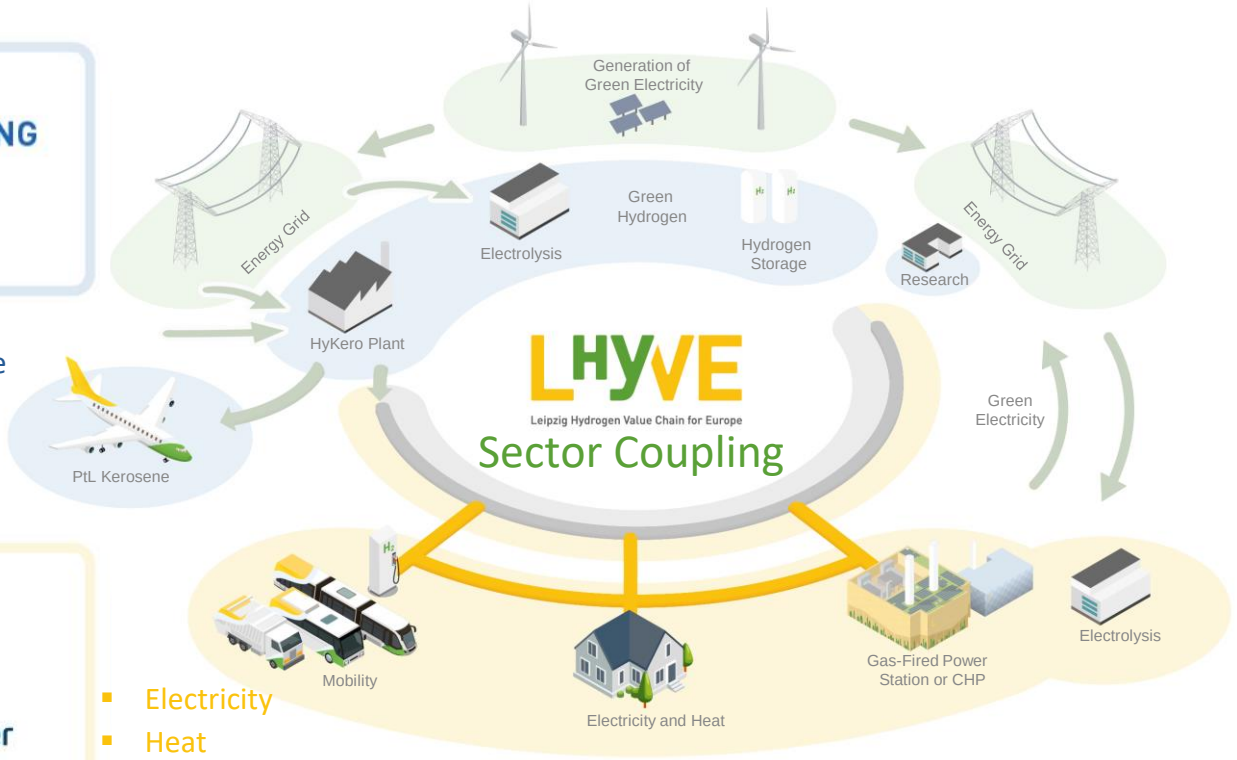
LHyVE – Joint Project within IPCEI

LHyVE ERZEUGUNG

- Hydrogen
- PtL Kerosene
- Naphtha
- Heat



LHyVE SYSTEM

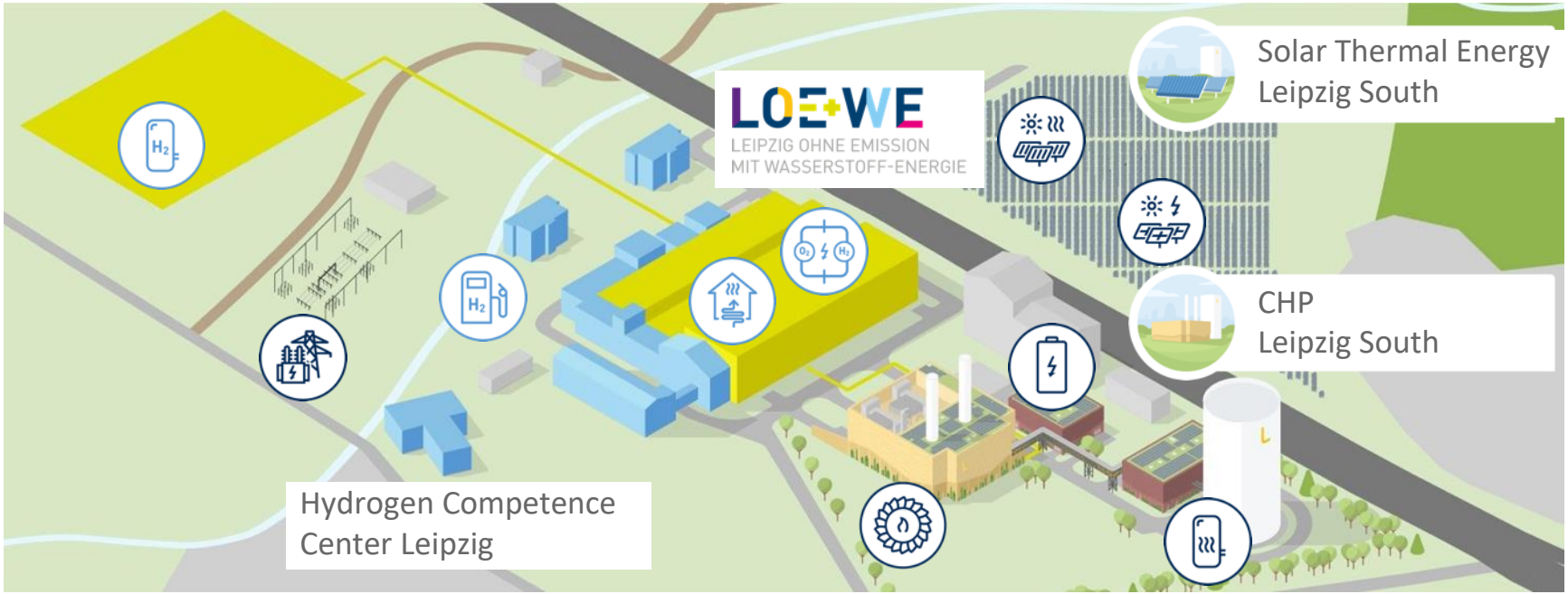
- Electricity
- Heat
- Hydrogen

Investment Volume: approx. EUR 940 M
Potential CO_2 Savings: approx. 1.4 Mt/a as from 2034

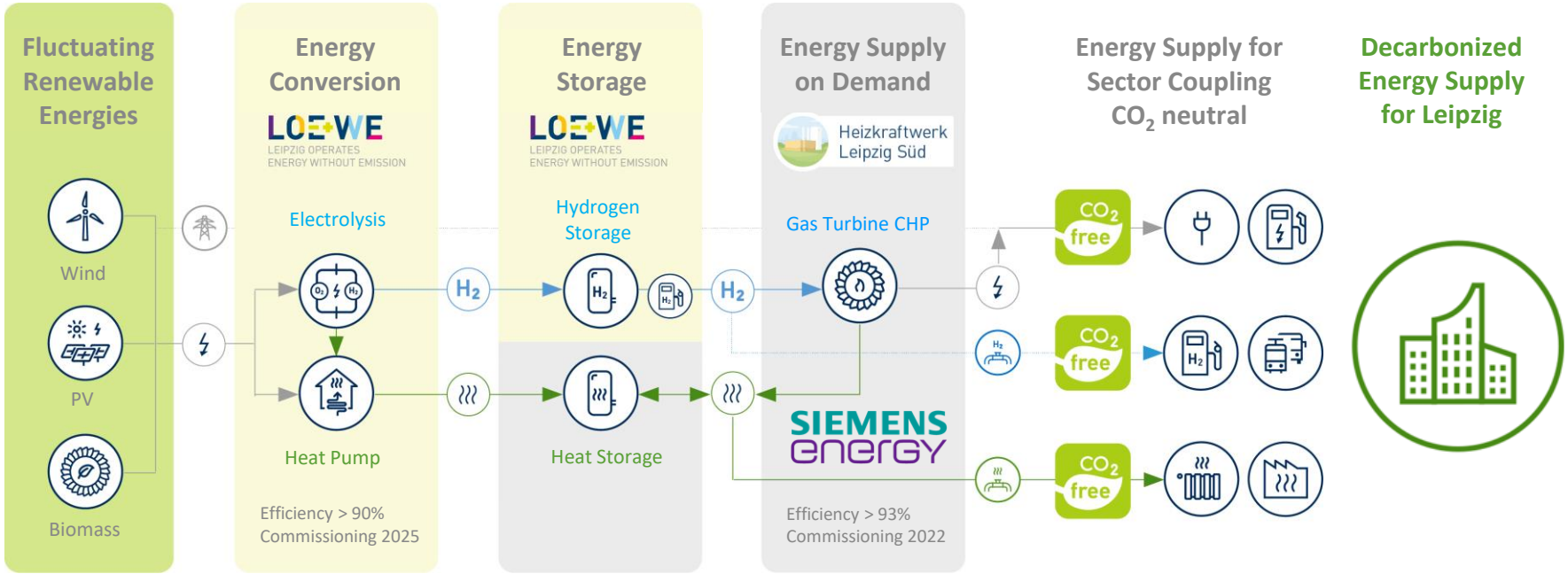
LHyVE TRANSPORT

Grafik: Centralgestalt GmbH

Energy Center Leipzig South – Competence Center for Green Energy and Hydrogen



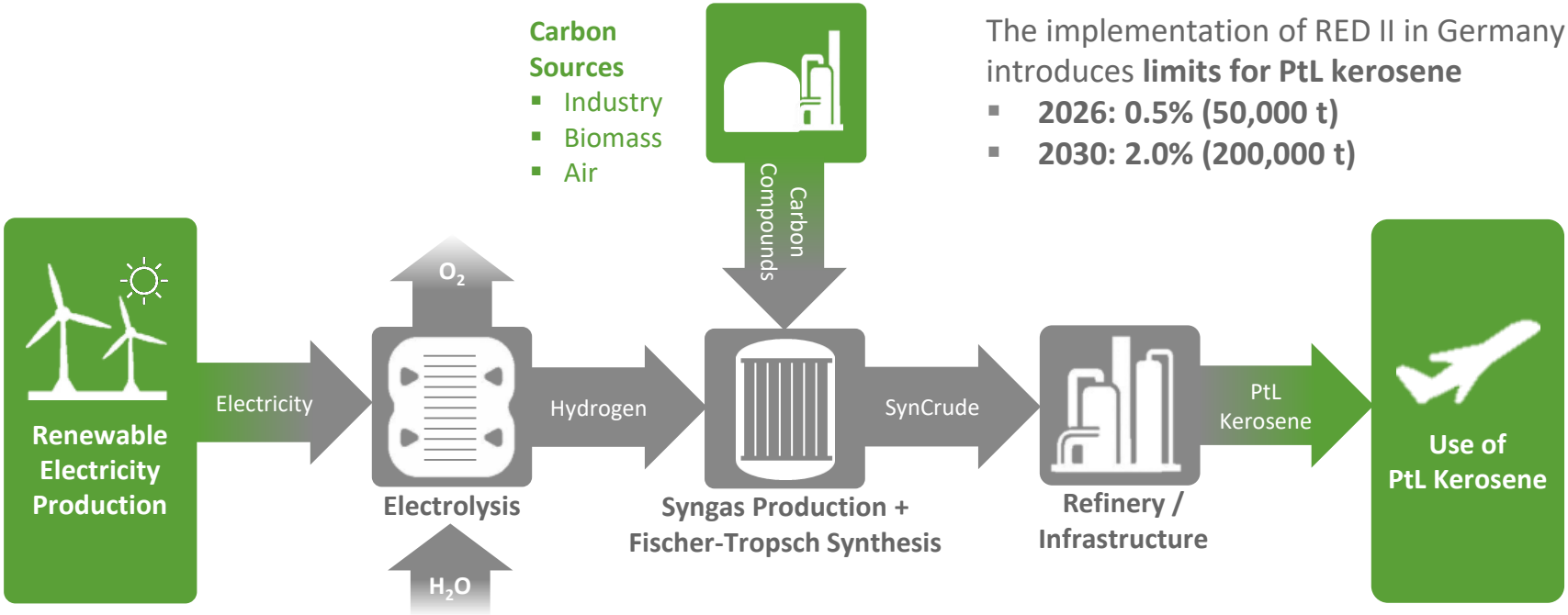
Gas Turbine CHP Leipzig South – Demonstration of a CO_2-free Energy Supply



PtL Kerosene Production Route (acc. to PtL Roadmap)

Carbon Sources
- Industry
- Biomass
- Air

The implementation of RED II in Germany introduces **limits for PtL kerosene**
- **2026: 0.5% (50,000 t)**
- **2030: 2.0% (200,000 t)**



Source: PtL-Roadmap - Nachhaltige strombasierte Kraftstoffe für den Luftverkehr in Deutschland, Government of Germany, 04/2021

PtL Kerosene – The Pathway to Sustainability in Aviation

Major Advantages of PtL Kerosene (eSAF)

- **Significant reductions of GHG emissions** in aviation, they are higher than with SAF.
- **Meets international standards** (ASTM D7566 A1) as ‚Drop-in Fuel' when using the Fischer-Tropsch route.
- **No change of existing aircrafts and tank infrastructure** required.
- **CO_2 neutrality** to the greatest possible extent along full life cycle.

Quotas for PtL kerosene will be met as from 2026 only if industrial projects start in early 2022.

Prerequisites for Industrial Projects

- **Application of TRL 9 technologies** using ASTM-approved production routes.
- **Open selection of green carbon sources**, i.e. both CO_2 and other biogenic sources.
- **Uninterruptible green power supply** to ensure plant operation all year round.
- **Fast legal approval**.
- **Legal conditions** have to consider all aforementioned criteria.

The HyKero plant within the LHyVE project is the only industrial plant for production of PtL kerosene.

HyKero Plant for Production of PtL Kerosene

Feedstock

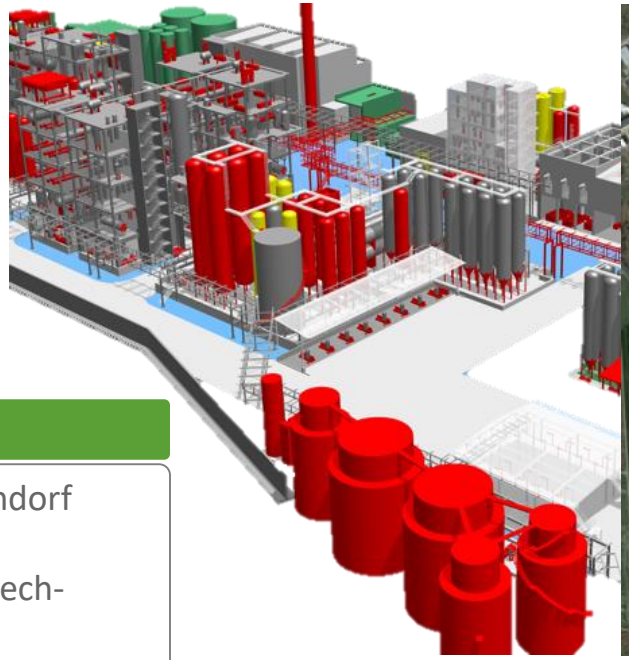
- 86.5MWh/h green electricity
- 6,760kg/h green methane

Products

- 41,200t/a PtL kerosene
- 10,960t/a green naphtha
- 1,430t/a green hydrogen

Highlights

- Location: Industrial Park Böhlen-Lippendorf
- Area required: 58.8ha (140 x 420m)
- New EDL plant design based on TRL 9 technologies, 100% CO_2-emission-free
- Intended start of production: 1st quarter 2026



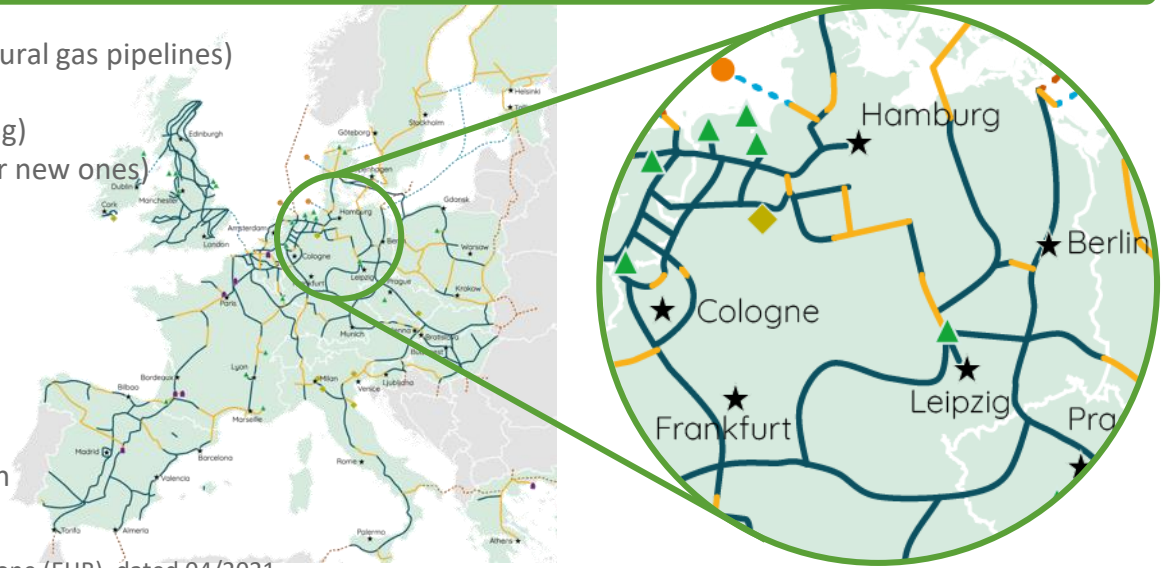
69 km H_2 Pipelines for the Leipzig Region and the Central German Hydrogen Region in European Context

Implementation of the first parts of the European H_2 Backbone and connection to other EU states within IPCEI. Until 2040 the H_2 backbone will be extended to all directions with a total length of 39,700 km.

- Existing H_2 pipelines (repurposing of natural gas pipelines)
- New H_2 pipelines
- Export / Import H_2 pipelines (repurposing)
- Underwater H_2 pipelines (repurposing or new ones)

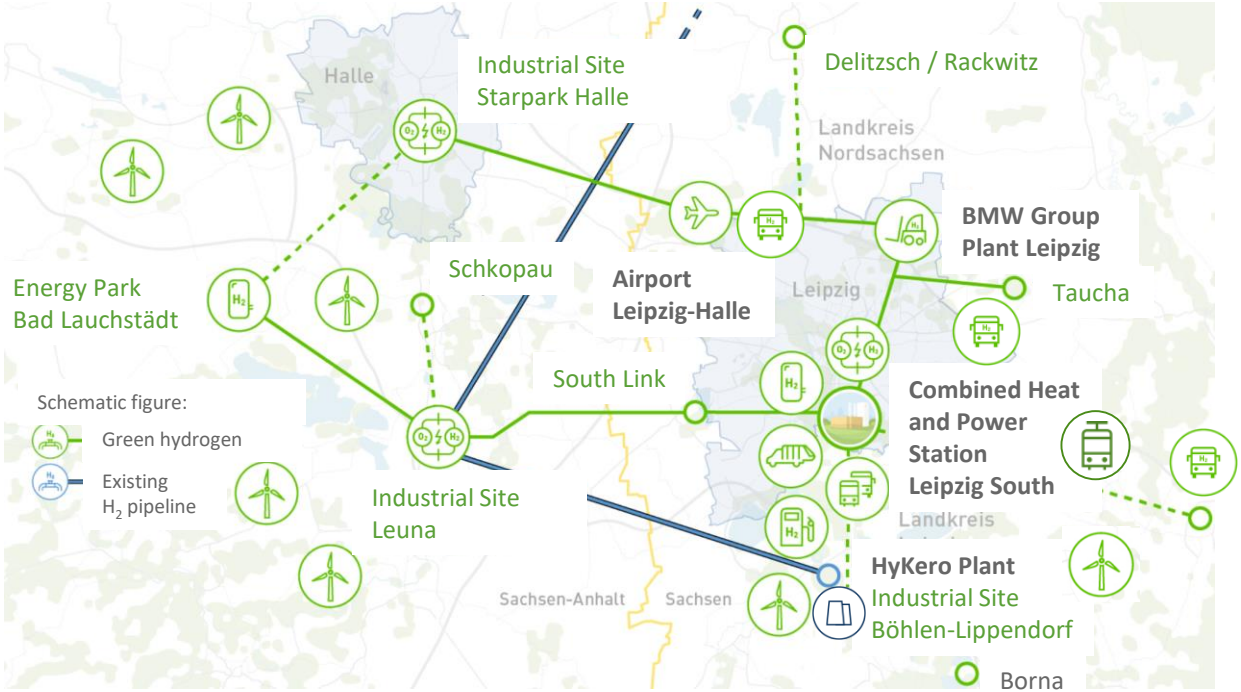
- Countries considered in the study
- Countries not considered in the study

- Possible H_2 storage in salt cavity
- Possible H_2 storage in aquifer
- Possible H_2 storage in old gas field
- Energy island for offshore H_2 production
- ★ City (for the purpose of orientation)



Source: Gas for climate – European Hydrogen Backbone (EHB), dated 04/2021

Efficient Regional and Transregional Sector Coupling



Important component for climate change

Jointly lead the way

Enable the transformation of transportation

Saxon, National and European Dimension

Current Synergies in the LHyVE Project

- **Linkage with existing infrastructure** in the city and the region.
- **Broad range of green energy sources** allows for comprehensive sector coupling:
  - **Supply**: electricity, hydrogen, heat
  - **Transport**: electricity, hydrogen, PtL kerosene
  - **Industry**: electricity, hydrogen, naphtha, heat
- **Worldwide first industrial PtL kerosene production**.
- **Creation of new jobs and safeguarding existing ones**.

Further Synergies (selection)

- **Connection to national and European infrastructure,** e.g. as hydrogen buffer storage.
- **Groundbreaker in the transformation of the coal district ,**Central German Coal District‘.
- **Direct power supply from 605 MW solar park and 102 MW wind park** for HyKero plant and for extension of hydrogen production.
- **Stronger integration of HyKero plant and DOW production** at the Böhlen-Lippendorf site:
  - Use of DOW‘s H_2 pipeline Böhlen-Schkopau
  - Use of process heat to a greater extent

LHyVE

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Thank you!