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Perspective on Fuel Cell Trains in East Germany

FCH JU, „Fuel cells and hydrogen in the railway environment”, 17 May 2019

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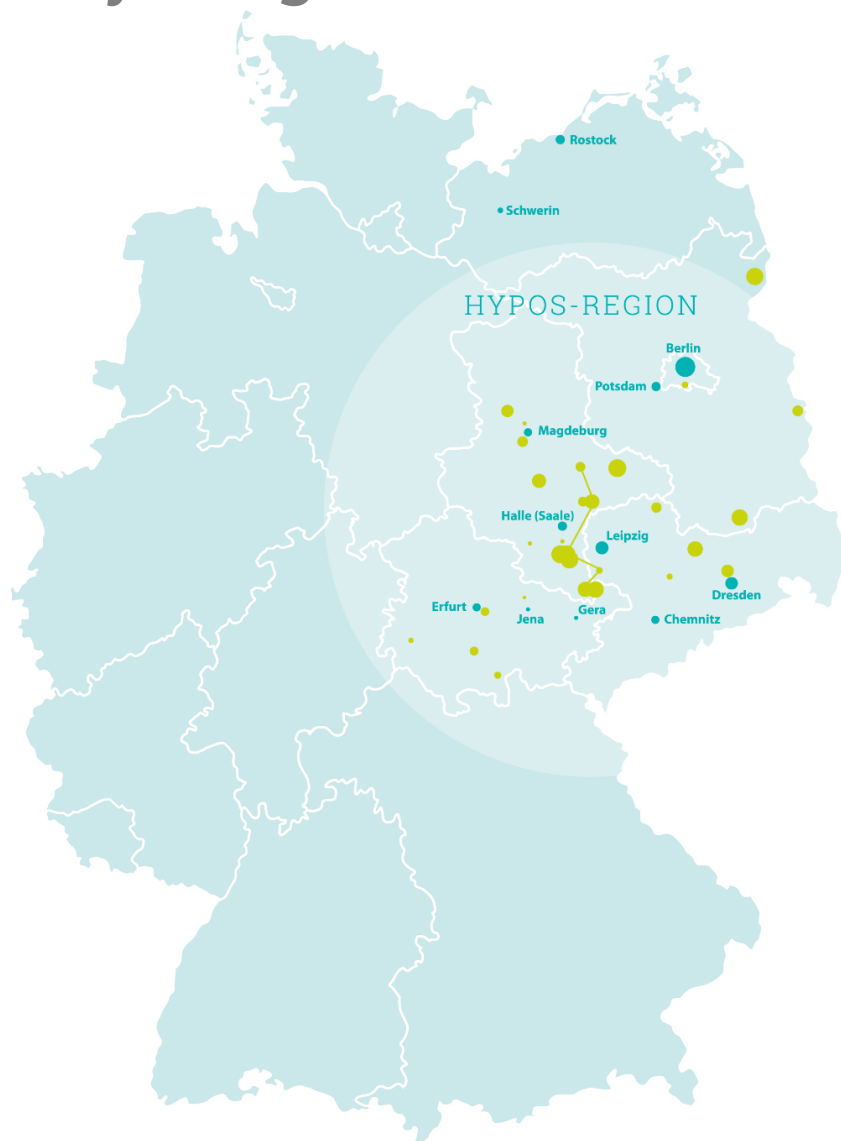


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H Y P O S HYDROGEN POWER STORAGE & SOLUTIONS EAST GERMANY

Hydrogen in East Germany



Middle Germany: Saxony, Saxony-Anhalt, Thuringia

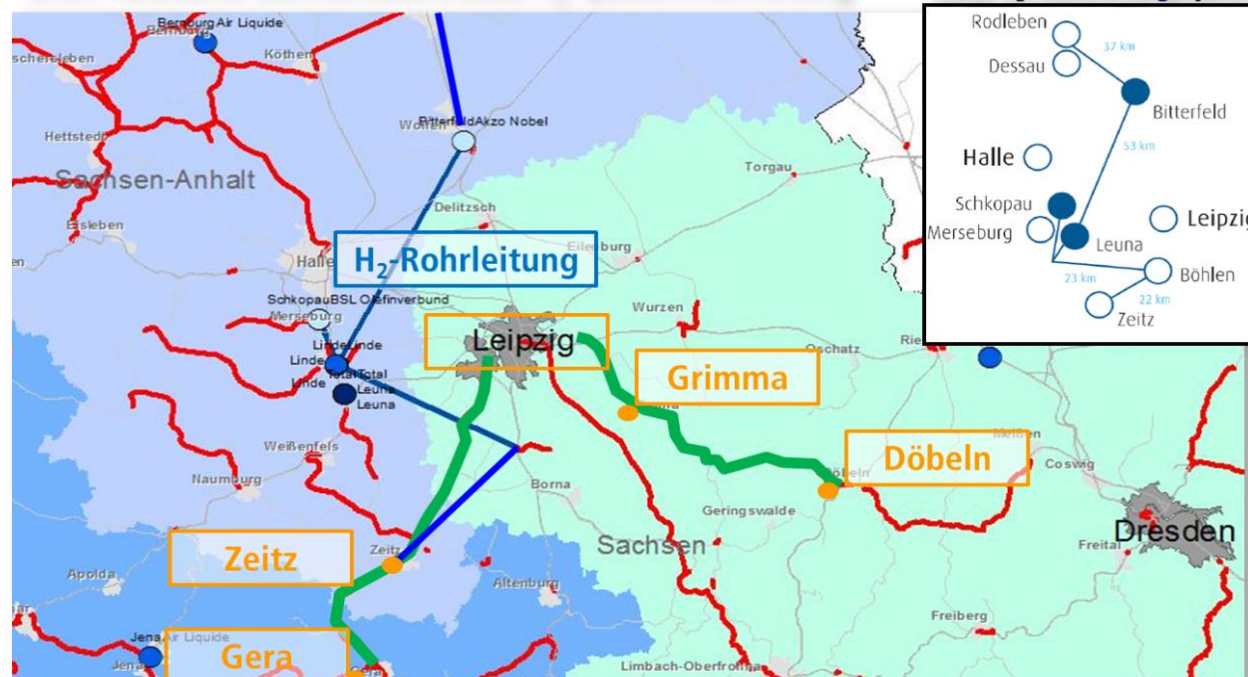
- hydrogen-related:
 - Middle German Chemical Triangle with large hydrogen demand: 3.6 bn m³/a
 - dedicated hydrogen Pipeline: 200 km
 - large-scale storage in salt cavern
 - **Green Hydrogen activities since 2013!**
- train-related:
 - several regional commissioner
 - remaining nonelectric routes
 - first test drive of FC-train in February

Feasibility Study on FC-Trains in Middle Germany

Background & Target

- future tender with new modalities concerning technology and infrastructure
- possible routes:
 - Leipzig – Grimma – Döbeln
 - Leipzig – Zeitz – Gera
- evaluation concerning:
 - technology in context
 - refuelling infrastructure
 - drive through Citytunnel Leipzig
 - railway installations

Grau: Bahnstrecken; Rot: nicht elektrifizierte Bahnstrecken;
Grün: Relevante Bahnstrecken; Blau: H₂-Quellen/Rohrleitung



Source: HYPOS 2017

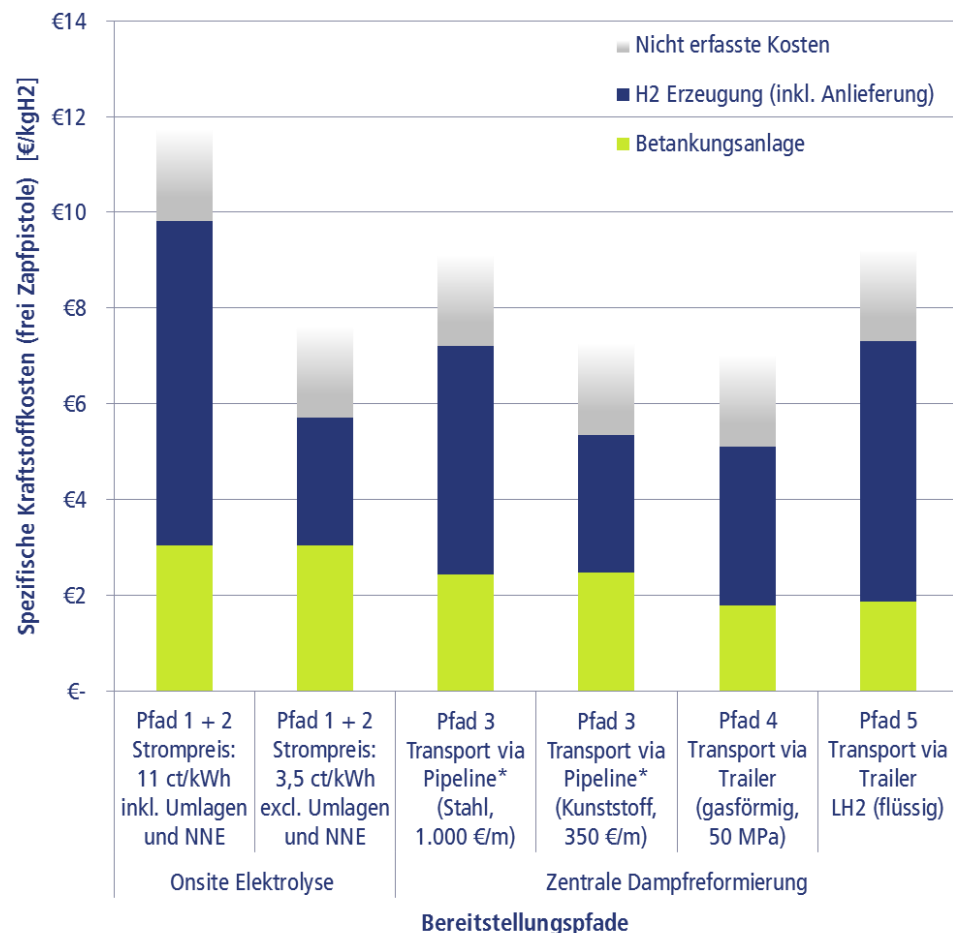
Commissioner:



Contractor:



Feasibility Study on FC-Trains in Middle Germany



*zum gemeinsamen Tankstellenstandort beider Strecken in Leipzig; Ergebnis nicht auf die Tankstellenstandorte Grimma und Gera übertragbar

Quelle: HYPOS 2017

Specific Fuel Costs, €/kg H₂

- largest expense are hydrogen production cost
- path 1+2:
 - possible hydrogen cost of 5-6 €/kg H₂
 - via onsite electrolysis, pipelines, compressed transportation
- cheapest opportunity remains: SMR+pipeline (path 3), SMR+trailer (path 4)

Commissioner:



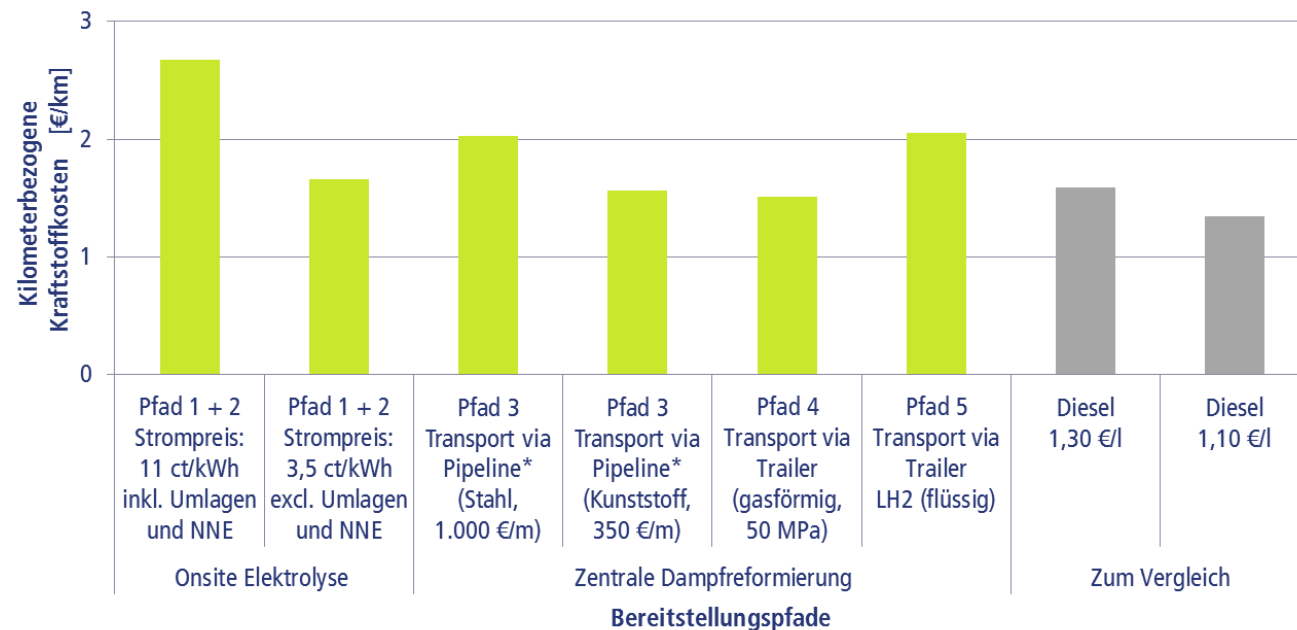
Contractor:



Feasibility Study on FC-Trains in Middle Germany

Cost per Kilometre, €/km

- Diesel:
 - 1,3-1,6 €/km
 - at diesel cost of 1,1-1,3 €/l
- **hydrogen cost:**
 - 1,5-2,7 €/km
 - competitive at high diesel price of 1,3 €/l



*zum gemeinsamen Tankstellenstandort beider Strecken in Leipzig; Ergebnis nicht auf die Tankstellenstandorte Grimma und Gera übertragbar

Quelle: HYPOS 2017

- consumption optimisation,
- technology progress,
- carbon pricing

Commissioner:



Contractor:



Funding Opportunities

Middle Germany is facing a structural transformation!

- phase-out of lignite mining
- phase-in of new technologies and value chains
- participation process including basically all local/regional parties
- **in this context hydrogen is one of the major topics in Middle Germany**
 - supplier: large electrolyser projects
 - storage: salt cavern to be realised as large-scale hydrogen storage
 - distributor: utilisation of hydrogen grid and gas grid
 - consumer: refinery, chemical industry, households and mobility
- opportunity to fund FC-trains projects with structural transformation

Future Projects

Targets of Local Commissioner ZVNL

- several routes are in consideration:
 - Leipzig – Grimma – Döbeln: gradual implementation of FC-trains, regular operation planned with tender in 2025, implementation in local-traffic grid
 - Leipzig – Zeitz – Gera: consideration of freight traffic, tender in 2024
 - Glauchau – Rochlitz – Colditz – Großbothen: reactivation of decommissioned route, restoration of all infrastructure
- year 2019: in-depth study on future routes, hydrogen supply chain, legal aspects
- year 2020-2021: building of refueling infrastructure
- year > 2021: procurement of trains

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