Hydrogen Roadmap - PepsiCo, Inc.

PURDUE UNIVERSITY | School of Industrial Engineering

Team 19

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Client Background

- PepsiCo is a multinational beverage, food, and snack company that produces a broad portfolio of products.
- PepsiCo's new pep+ campaign outlines the company's goals for becoming more sustainable, which includes achieving a 40% reduction in emissions by 2030, and net-zero emissions by 2040.
- PepsiCo maintains one of North America's largest private transportation fleets.

Problem Statement

PepsiCo's pep+ initiative aims to reduce the emissions of its transportation fleet by 75% by 2030. Our team is tasked with analyzing PepsiCo's operations to determine the viability of green hydrogen as a fuel source for long haul transport, and then develop an economic model to ascertain whether hydrogen fuel cell vehicles (FCEVs) can play a role in the company's transition to a sustainable future.

Current Fuel Sources

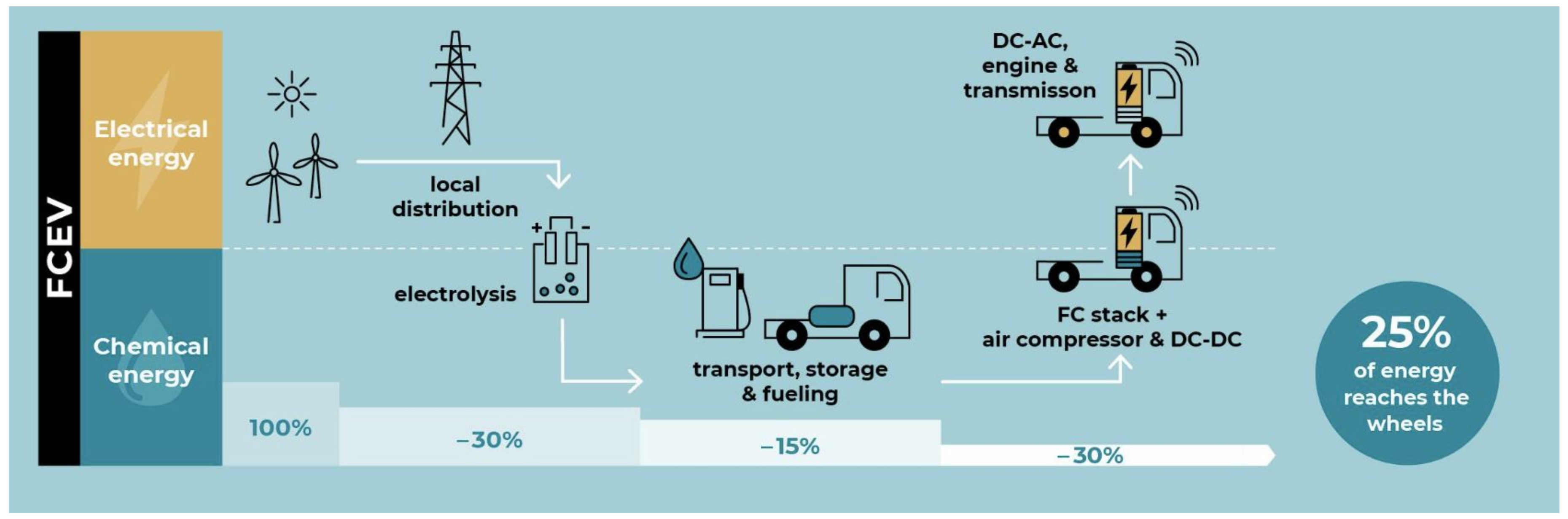
PepsiCo is considering a variety of technologies to achieve their fleet's emission goals including:

- Battery Electric Vehicles (BEV)
- Hydrogen Fuel Cell Electric Vehicles (FCEV)

BEV	FCEV
Range: 500 miles	Range: 600+ miles
Charge time: 35-40 minutes	Refuel time: 15-20 minutes
Infrastructure is already in place	Additional capital required for infrastructure, distribution tanks, etc.
Can be implemented now at a relatively low cost	Can be implemented by 2025-2030
Utilizes an existing power grid to get energy required to recharge	Requires physical transportation of hydrogen for refuel (via tanks or pipelines)

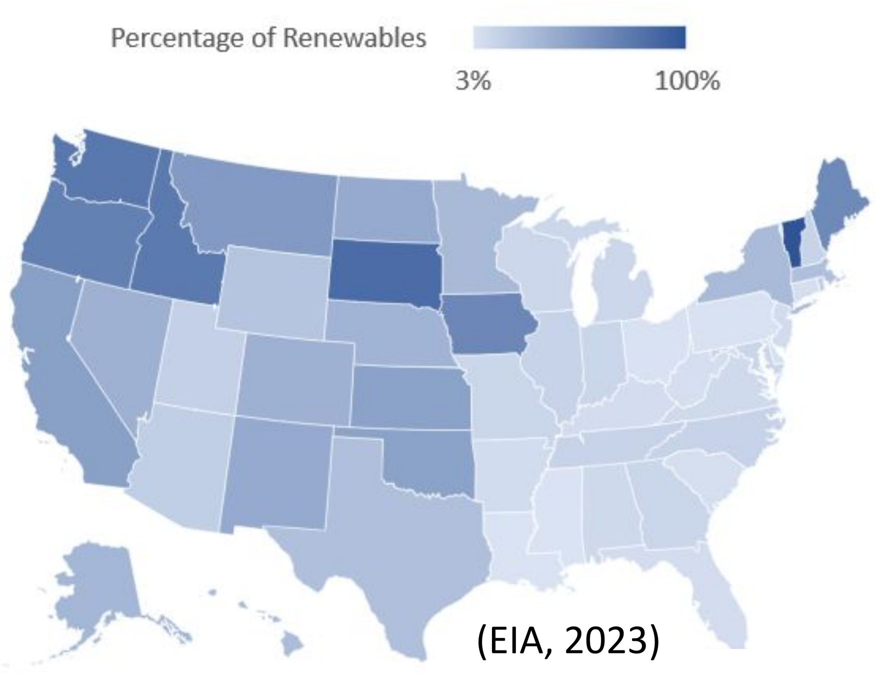
System Model

Green hydrogen is manufactured through a process called electrolysis, which must be powered by renewable energy. This process, including the subsequent distribution costs, is presented below. Our analysis is centered on its future economic feasibility.

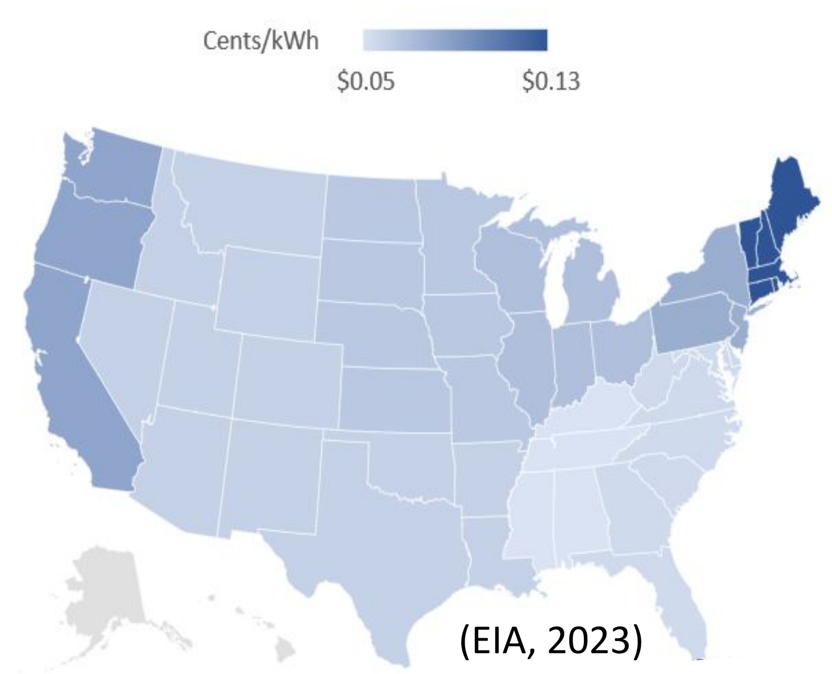


Future FCEV and green hydrogen costs are highly uncertain. Any potential model of future costs must take a holistic viewpoint. Below are two potential indicators.

Renewables as a Percent of Net Energy Generation, 2020

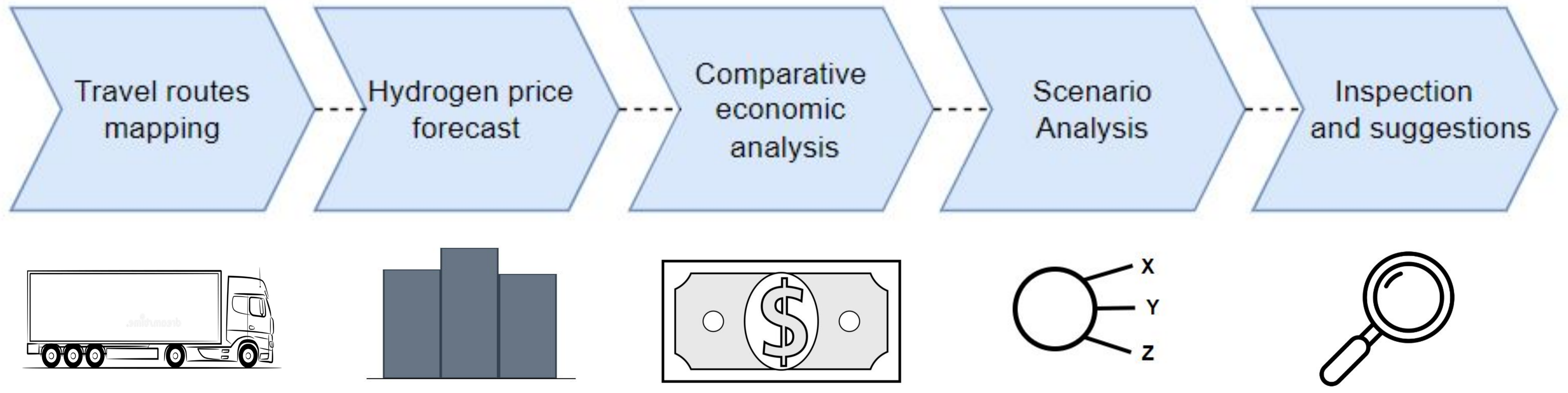


EIA Electricity Price Estimate, 2030



Methodology

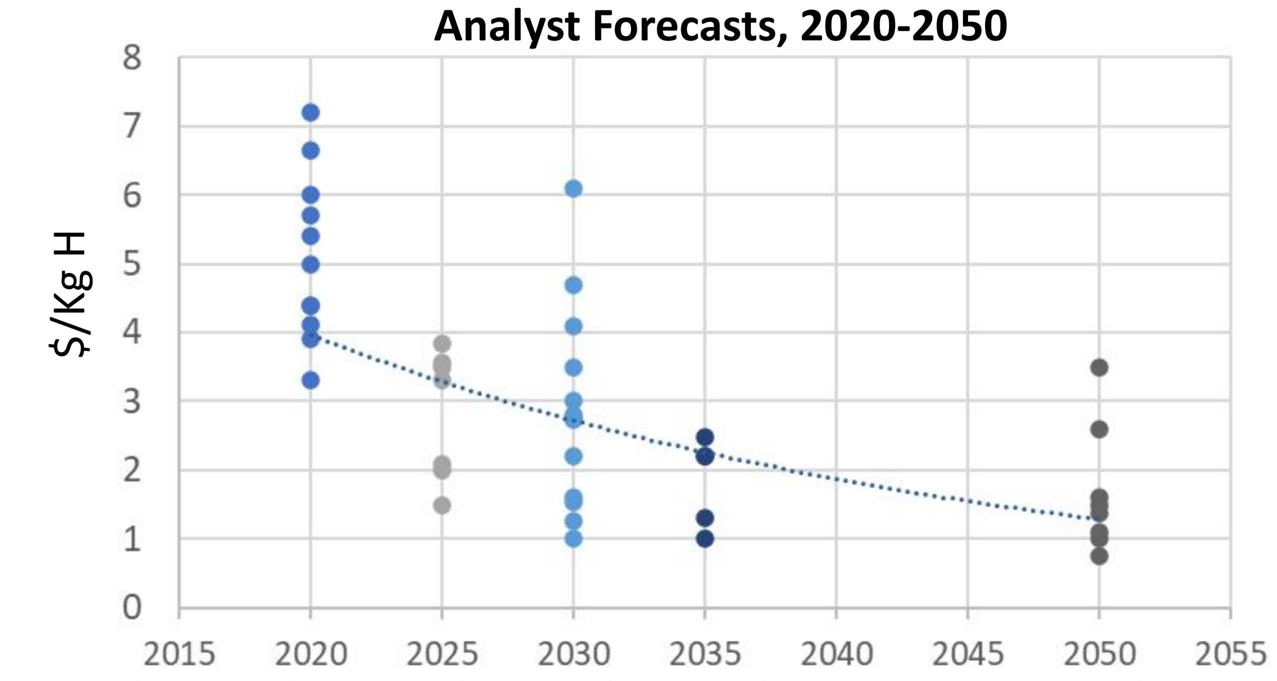
Our approach:



Results

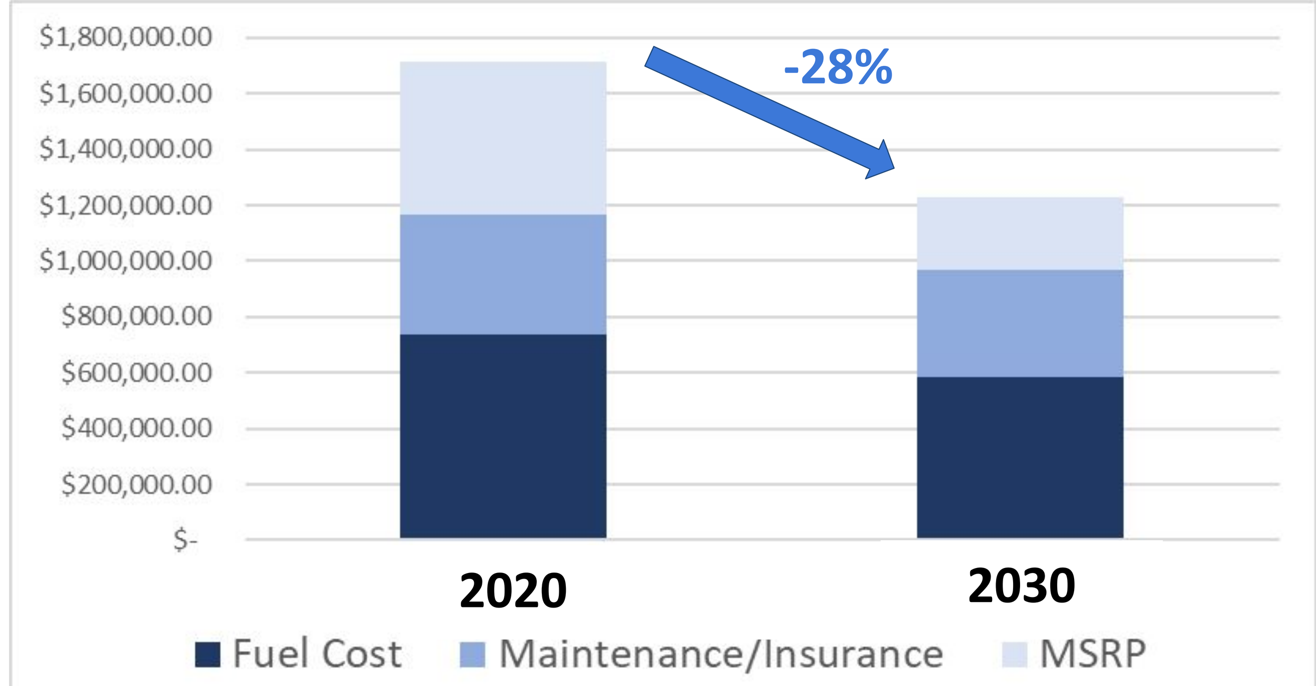
Our analysis shows widespread industry expectations for decreasing costs of green hydrogen. These lower costs rely on assumptions of greater scale, share gain of renewable energy, and government support.

Production Cost of Green Hydrogen, Analyst Forecasts, 2020-2050



Further analysis of the total cost of an FCEV was conducted. Component costs, considered and modeled individually, resulted in a forecasted cost decline of 28%.

Total Lifetime Asset Cost Decline, 2020-2030 (asm. 15 year life)



Additional results to be compiled: 1. Complete scenario analysis encapsulating the potential variability of assumptions. 2. Combined economic analysis of the overall cost model and travel routes.

Discussion

Our results will be summarized for PepsiCo through the following deliverables:

- Economic model detailing our methods, assumptions, and sources
- Scenario analysis that acknowledges the potential variability of our assumptions and future predictions
- Commentary and analysis concerning the FCEV industry outlook, centered on key assumption that should be tracked