

2023 NGECE Annual Meeting

Hydrogen Fuel Cell Multiple-Unit Train

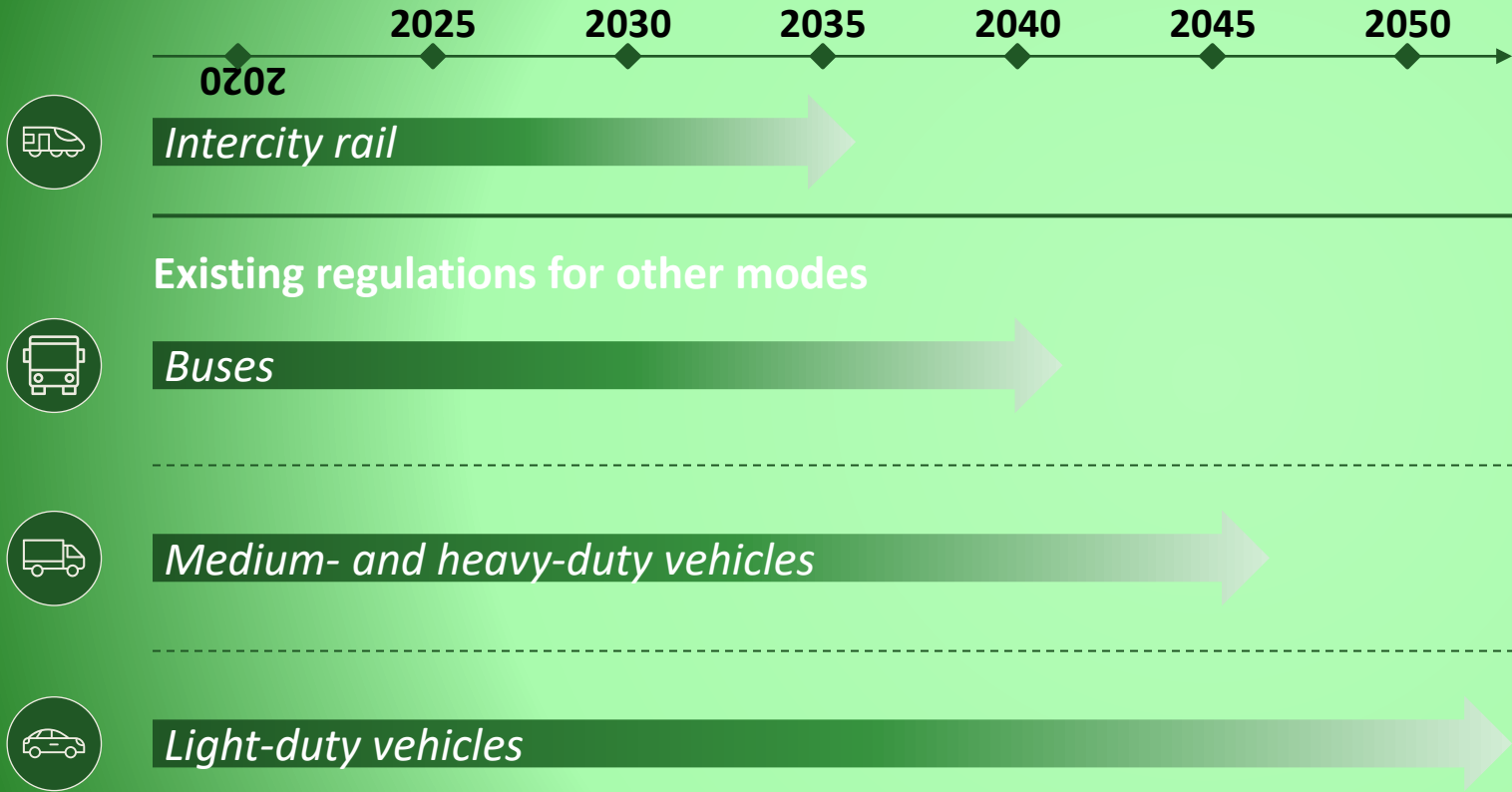
Ryan Sharpe

California Department of Transportation
Division of Rail and Mass Transportation



The NGEC will provide national leadership in standardization, acquisition, financing and management of passenger rail equipment.

Regulatory environment: Off-road vehicle fleets, including passenger trains, must be 100% emissions-free by 2035



Caltrans DRMT¹ goal (EO N-79-20):

- Complete rail fleet ZE by 2035²

Innovative Clean Transit Regulation:

- New buses must be ZE after 2029
- Public transit agencies bus fleets must be fully ZE by 2040

EO N-79-20:

- Trucks fully ZE by 2045 wherever feasible

EO N-79-20 & ACC II:

- In-state sales of new passenger cars & trucks 100% ZE from 2035



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(1) DRMT = Division of Rail and Mass Transit
 (2) Off-road vehicle fleet must be zero-emission by 2035 according to the EO N-79-20

Strategy: The transition to ZE equipment encompasses existing routes as well as planned routes



Existing intercity routes

Existing intercity routes	Length	Stations
Capitol Corridor	168 miles	18 stations
San Joaquins	315 miles	16 stations
Pacific Surfliner	351 miles	31 stations

New routes to be ZE

Valley Rail	118 miles	1 existing, 15 planned
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Future ZE routes

Central Coast	320 miles	5 stations
Antelope Valley	76 miles	12 existing, 1 planned

Options

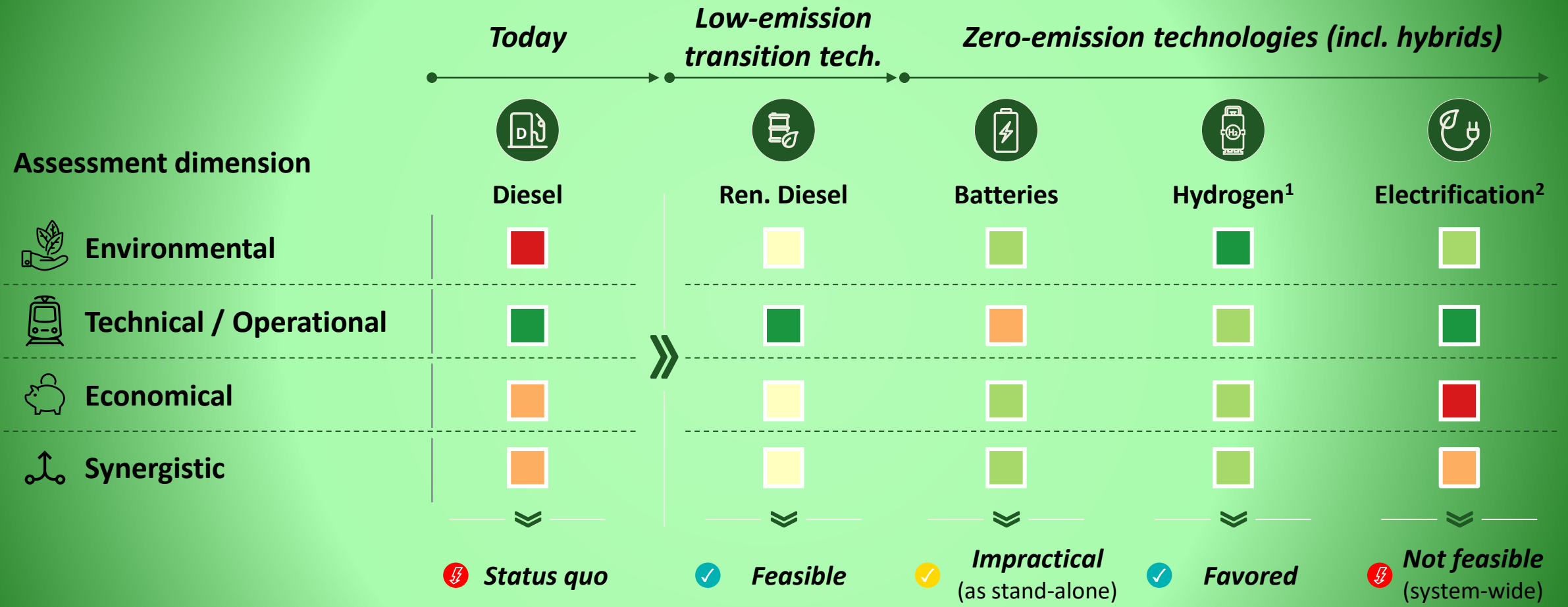
1
Pursue hydrail locomotives

2
New ZEMU procurement



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Range: Hydrogen will serve as the long-term primary power source for the Caltrans intercity fleet to achieve ZE



Rating: ■ Excellent ■ Good ■ Mediocre ■ Inferior ■ Requirements not fulfilled

(1) Please note that hydrogen is a solution for the intercity fleet; it is not intended to serve as a general recommendation. (2) Considering system-wide electrification

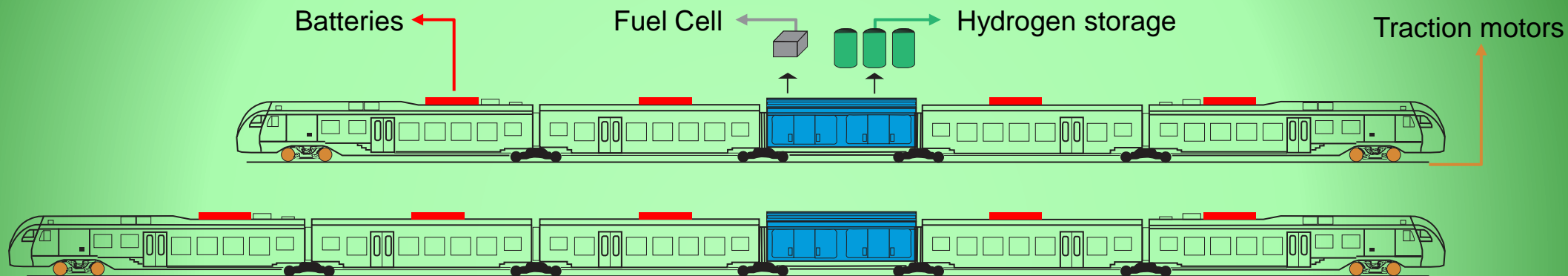
Source: DB assessment



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New opportunities: ZEMU vehicles will be used to expand passenger rail service in California

Possible ZEMU configurations¹



Illustrative Example¹

Caltrans targeted characteristics

- **ZEMU:** Zero-emission operation
- **Hydrogen:** long range, fast fueling
- **Batteries:** power & regenerative braking-enabling
- **Deployment:** Expand passenger rail service in California
- **Passenger capacity:** ~200 seats
- **Max vehicle speed:** 90 mph
- **Max vehicle range²:** ~1000 miles (4-car); ~800 miles (5-car)



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(1) General illustrative concept based on SBCTA ZEMU (2) Under favorable conditions

Questions

Ryan Sharpe | ryan.sharpe@dot.ca.gov
Chief, Office of Assets and Equipment



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