Hydrogen Transportation

Joint Committee on Transportation

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About Us

We Are a 501 (c) (3) nonprofit, and public-private partnership between the U.S. Department of Energy, national labs, and on-the-ground fleets throughout Oregon and Washington.

Our Mission is to provide resources, professional support, “fuel agnostic” expertise, and education and outreach to help our members navigate and adopt alternative fuel and fleet efficiency solutions.

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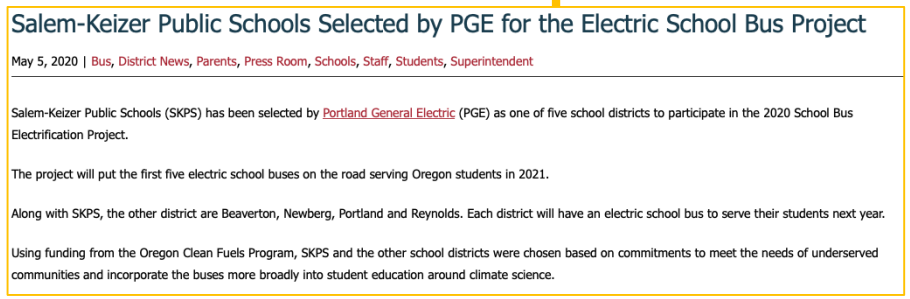
Our Core Focuses

Education, Information, and Outreach

Technical Assistance

Trainings and Certifications

Grants, Incentives, Deployments



Salem-Keizer Public Schools Selected by PGE for the Electric School Bus Project

May 5, 2020 | Bus, District News, Parents, Press Room, Schools, Staff, Students, Superintendent

Salem-Keizer Public Schools (SKPS) has been selected by Portland General Electric (PGE) as one of five school districts to participate in the 2020 School Bus Electrification Project.

The project will put the first five electric school buses on the road serving Oregon students in 2021.

Along with SKPS, the other district are Beaverton, Newberg, Portland and Reynolds. Each district will have an electric school bus to serve their students next year.

Using funding from the Oregon Clean Fuels Program, SKPS and the other school districts were chosen based on commitments to meet the needs of underserved communities and incorporate the buses more broadly into student education around climate science.

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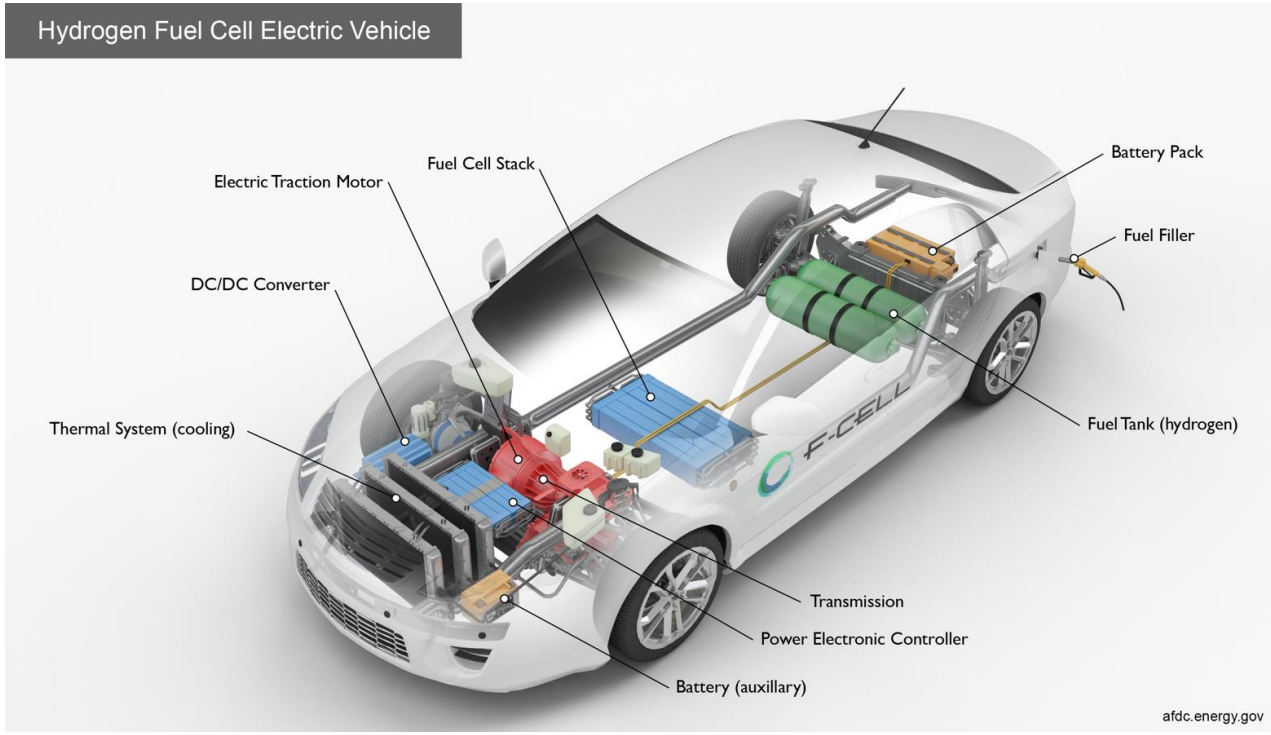
Fuel Cell – the *other* EV

Key Differences between Fuel Cell Electric Vehicles (FCEV) and internal combustion engine (ICE):

1. Employs a fuel cell(s)
2. Battery pack
3. Electric motors
4. Hydrogen storage tanks

Instead of smog, the byproduct of driving is water vapor



The Appeal of Hydrogen Vehicles/Equipment

- Total Cost of Ownership trending down
- Zero tail pipe emissions
- Resilience - ability to produce fuel and energy in place
- Work well in fleets of all fuel types
- Performance
  - Quick refueling times
  - Extreme weather performance
  - Power and efficiency

Toyota-Kenworth
Hydrogen Drayage Truck

https://www.youtube.com/watch?v=mEycPDd2bW0

Where H2 is Thriving

Freight

Mass Transit

Best vehicle applications for hydrogen fuel-cell:

- Need for large amounts of continuous power
- Need for longer ranges
- Need for quick refueling

Fleet Vehicles

Material Handling

Fuel Cell Transportation in Oregon

1

Vehicles

0

Fueling Infrastructure

Barriers

1. Needs collaborative planning between public and private sectors for fueling infrastructure

2. Funding for fueling infrastructure

3. Incentives to consumers and fleet operators for vehicles/equipment

Conclusion

1. Hydrogen vehicles excel in heavy-duty applications, all weather conditions, and have quick refueling times

2. Hydrogen vehicles work well as a zero-emission alternative and can augment battery electric fleets

3. There are barriers facing FCEV deployment in Oregon which require leadership from policymakers

4. FCEVs are new and developing – give them time and support to mature

5. We need both light duty and heavy-duty FCEVs

Thank You

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Heavy Duty Trucks

Light duty needs heavy duty; heavy duty needs light duty

Fuel Cell Electric Trucks

- Advanced Clean Truck rule
- Fueling infrastructure projects
  - 3 heavy duty H2 stations
    - More being announced
  - Ontario, Wilmington and Port of Long Beach
  - 1-2 temporary fuelers
- CARB & CEC heavy duty funds
  - Include heavy duty infrastructure

Truck automakers & others

- Toyota-Hino alliance
- Daimler-Volvo alliance
- Nikola Motor
- Hyundai
- Cummins

Source: California Fuel Cell Partnership

Additional Information

1. **Routes require 1.5 BEBs for every standard bus replaced on routes, while FCEBs are a 1:1 replacement.** Foothill Transit in California found that to replace buses along a major 42-mile bus route, they would need 34 BEBs or 23 FCEBs. That is 1.5 BEBs per every FCEB.

2. **Infrastructure costs are lower for FCEBs with scale of fleet deployment.** Foothill Transit estimated that it would cost $4 million for a hydrogen fueling station which could serve up to 30 buses. The infrastructure required for BEBs would cost $10.95 million.

3. **Foothill Transit found that Fuel Cell buses have comparable costs per-mile for fuel and maintenance.**

Fuel Cost/Mile/Bus		Annual
Fuel Cell	$1.00	$1,305,111.63
BEB/kW	$0.76	$986,664.39

Scheduled Maintenance per Mile		Annual Cost
Fuel Cell	$0.12	$156,613.40
BEB	$0.04	$52,204.47

4. **Mid-life replacement costs per bus were a fraction for FCEBs ($30k/bus) vs. BEBs ($200k/bus).**

5. **In total, Foothill Transit estimated in this analysis that FCEBs would save the agency nearly $13 million compared to BEBs over 12 years of useful bus life.**

https://cafcp.org/sites/default/files/07-24-2020-Foothill-ZEB-Update-to-Board.pdf

Stations Getting Bigger, Costing Less