

March 8, 2018

The Honorable Jon Niermann
Commissioner
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

Dear Commissioner Niermann,

The State of Texas is uniquely positioned to take advantage of the new and important innovation toward motor vehicle emissions reduction and efficiency improvements, both for light-duty and heavy-duty vehicle fleets. The rapid development of hydrogen technology and its eventual application to power motor vehicles, industrial forklifts and renewable electricity micro-grids provides a strategic opportunity for the State of Texas to capitalize on this technology and diversification of energy resources long term.

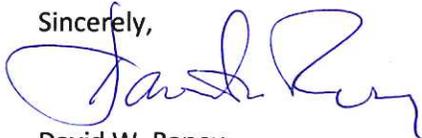
Toyota is committed to development of multiple pathways for hydrogen in the U.S. and globally. One specific opportunity we wish to bring to your attention is the existence of \$31.3M earmarked for potential funding in Texas of zero emission vehicle refueling infrastructure installation as part of the national Volkswagen settlement with the Federal EPA. We write to ask that support be given to applying a portion of these funds to installation of hydrogen refueling infrastructure strategically placed in major transportation corridors and/or shipping ports. This installation would parallel and support Toyota's in-state marketing of hydrogen fuel cell vehicles that are currently being developed, leased and sold in the United States.

The implications and ramifications of a near-term effort to develop hydrogen refueling infrastructure are broad, including:

- Expanding the consumer and commercial markets for true zero-emission vehicles,
- Seeding possibilities of transforming port drayage diesel trucks to zero-emissions hydrogen,
- Benefits to Texas State Implementation Plan (SIP) transportation emission reduction programs,
- Opportunities for the conversion of petroleum fueled industrial forklifts to zero-emission hydrogen, especially in non-attainment areas of the state, and
- Opportunities for alternate pathways to renewable energy storage and hydrogen production through electrolysis.

We look forward to working with you on this project, and thank you for your consideration.

Sincerely,



David W. Raney
General Manager
Toyota Motor North America, Inc.

cc: The Honorable Greg Abbott, Governor of Texas

TOYOTA's Hydrogen Initiative

An Additional Fuel Source for Fuel Cell Vehicles and Technologies



What is a Hydrogen Fuel Cell Vehicle?

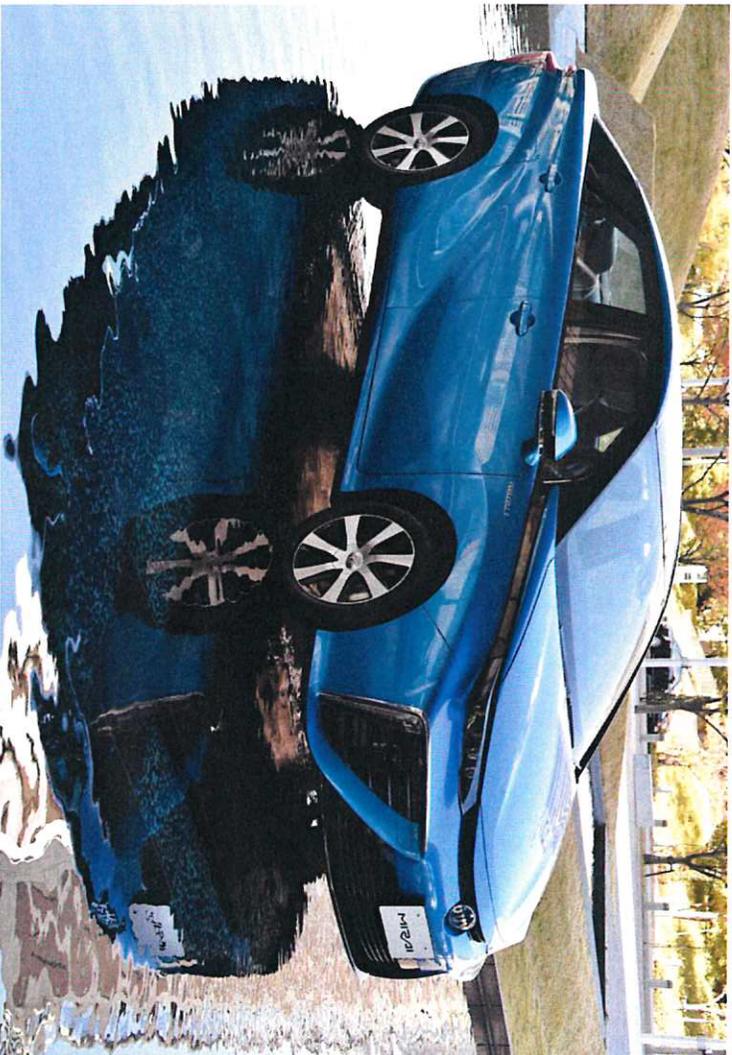
Over 20 years ago the technology started with the hybrid engine in the Prius. Development continued and the fuel cell vehicle was created to eliminate long charging times and battery life issues.

Fuel cell vehicles use hydrogen fuel to power an electric motor. Unlike conventional vehicles which run on gasoline or diesel, fuel cell cars and trucks combine from a chemical reaction between hydrogen and oxygen to produce electricity, which runs an electric motor.

There is no carbon emitted, so the only emission is water.



Let's learn a little more about the technology...



[Click on the photo to start video](#)

Components of Toyota Mirai Fuel Cell

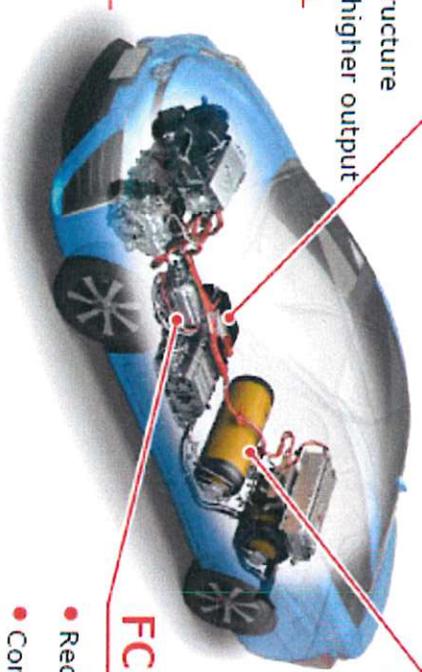
★ FC stack

- Innovative flow channel structure and Electrodes of cells for higher output
- Output/volume; 3.1kW/L

world top level

Humidifier less

- Internal circulation



★ High pressure hydrogen tank

- The light weight structure of carbon fiber reinforced plastic enabled
- Storage; 5.7 wt%*

world top level

FC boost converter

- Reduced number of cells in FC stack
- Common use of hybrid units

*Hydrogen mass/Tank mass

FC main components developed in-house to achieve world leading performance

Advantage of Fuel Cell Technology

Energy diversity

- Hydrogen sourced from a wide variety of primary energy

Fun to drive

- Electric motor enables smooth, quiet driving
- Excellent acceleration at start to low/mid speed



Zero emissions

- Zero tailpipe CO₂

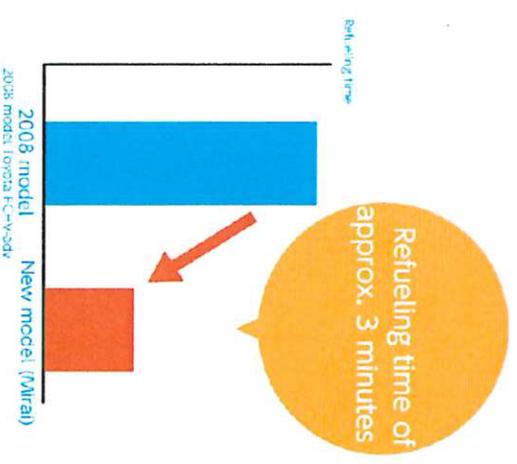
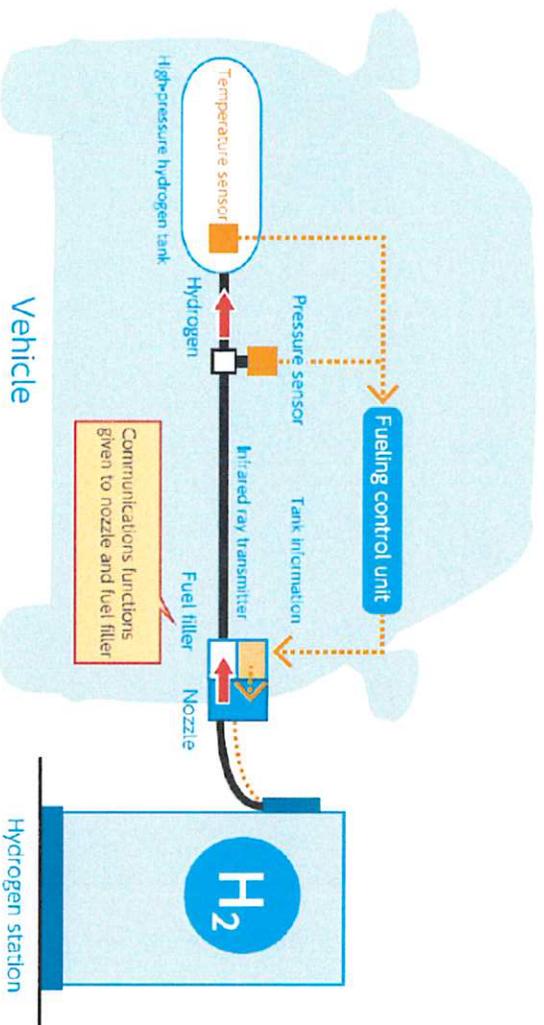
Usage

- Range (gasoline equivalent)
- Refueling (about 3 minutes)

Power supply (emergency use)

- High capacity

How does Hydrogen Refueling Work?



In response to new fueling standards (the same in Japan, the US, and Europe), fueling time of approximately 3 minutes has been achieved

Who is in?

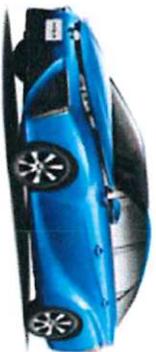
- Toyota alone is not the only advocate for Hydrogen
 - Transportation companies like Paccar, Honda, Hyundai, Mercedes, GM
 - Companies like Amazon and Wal-Mart utilize hydrogen forklifts for their distribution centers
 - Shell, Air Products, Air Liquide and other major industrial fuel/ oil companies are looking to H2 as fuel for the future



Toyota's Commitment to Fuel Cell Technology

TOYOTA

FCV



HINO

FC bus



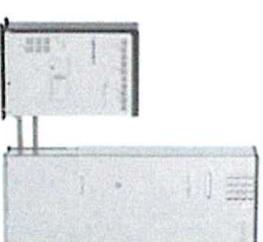
Toyota Auto Loom

folk lift



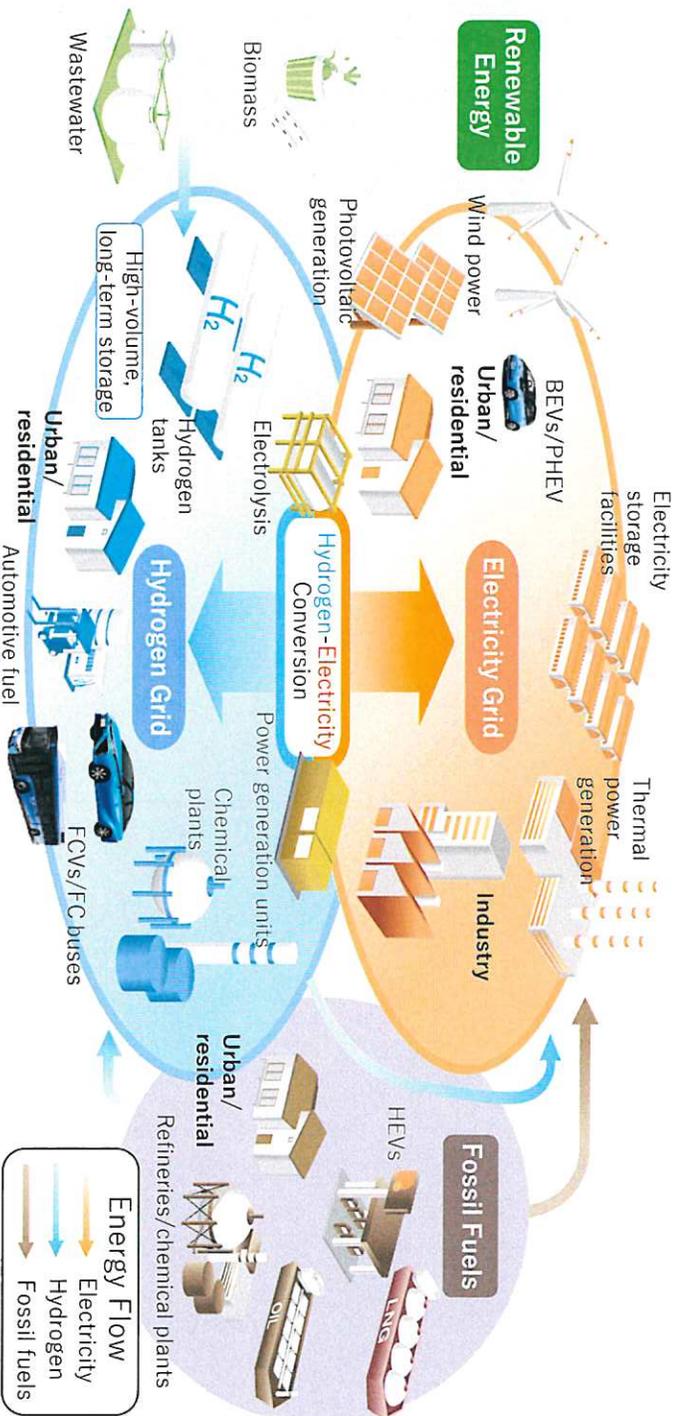
Aisin Seiki

Household fuel cell system



Hydrogen Microcosm in Texas

What is happening in Japan, could happen in the U.S. since fuel cell technology can be modified into stationary power sources.



Development of Infrastructure

- Fueling infrastructure is the backbone and the link that will develop Texas into a hydrogen market
- Fueling infrastructure can take different forms
 - Fuel station pump
 - OR on-site reformer
- Public funds are available, at no cost to taxpayers, that can be utilized by local municipalities and state agencies
 - Example: VW Diesel Settlement – Appendix D
 - Up to 15% of the settlement funds entitle to each states can be utilized to build H2 stations
 - Texas is entitled to \$209M from the VW settlement
 - Over \$30M can be utilized to develop H2 stations throughout Texas
- Such funding can capitalize on development of H2 fuel from:
 - Natural gas from the Permian Basin
 - Wind Farms of North Texas
 - Agricultural by-products





Discussion and Questions?