## ΤΟΥΟΤΑ

# **TOYOTA AUSTRALIA – FUEL CELL PROJECT**



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**TOPICS** 



FUEL CELLS & TOYOTA

## ENGAGEMENT ACTIVITIES

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HYDROGEN MOBILITY INDUSTRY SUPPORT & H<sub>2</sub> INFRASTRUCTURE





## WHY FUEL CELLS?

## TOYOTA GLOBAL ENVIRONMENTAL CHALLENGE







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### **TMCA VISION & MISSION**

Creating Innovative Mobility Solutions for All Australians.

## FUEL CELL VEHICLE DEVELOPMENT



## **3** TMCA VISION FOR FUEL CELL VEHICLES

 Create Sustainable Mobility for Australia's future Hydrogen Society.

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## THE DRIVING FORCES OF FUEL CELL ADOPTION

Hydrogen Society	Global CO <sub>2</sub> Targets	TMC 2050 Environmental Targets	Advantages of Hydrogen as a transport fuel	Hydrogen Manufacture
<ul><li>Transportation</li><li>Energy</li></ul>	<ul> <li>Introduction of vehicle CO2 emission targets</li> </ul>	<ul> <li>↓ 90% vehicle emissions</li> <li>↓ 100% building emissions</li> </ul>	<ul> <li>Zero emissions</li> <li>Short refill time (3-5 mins for commercial refueller)</li> <li>Long range</li> </ul>	Can be made from many sources e.g. Waste, solar, wind, hydro, fossil fuel



- Industry Approach (together with Government)
- Fuel Costs should be Competitive with other Fuels
- Hydrogen should be "Green" in the mid-term
- Stations should be Near Users and Convenient
- Fuel Cells are not just for Cars but Forklifts, Buses, Delivery Trucks & Stationary Power
- Demonstrate Hydrogen & Fuel Cell through Pilot activities

Toyota is working to establish a Hydrogen Society to meet the Environmental challenges of tomorrow.

· High energy density



## HYDROGEN INDUSTRY ANNOUNCEMENTS

#### 2018 was a big year for hydrogen in Australia.

#### **COAG Energy Council**

- Dr Finkel presentation supporting hydrogen economy
- Consider starting with approx. 20 stations nationwide focusing in capital cities
- Established Hydrogen Working Group of the council following this meeting

#### **CSIRO Hydrogen Roadmap**

• Provides a blueprint for the development of a hydrogen industry in Australia

#### **ARENA Future Export Study**

- Opportunities to meet future global demand
- Significant opportunity for Australia

#### **CSIRO** Ammonia Research

- Official launch in Brisbane (August 2018)
- 10 years developing process to extract hydrogen from Ammonia (NH3)
- Increases opportunity to support hydrogen export industry.



#### **MIRAI IN AUSTRALIA**

- TMCA introduced 3 Mirai vehicles to Australia in June 2016 to build awareness into the technology
- TMCA established its own Mobile Refuelling and Service facility in Altona in October 2016
- TMCA has been engaging with Government, Participants in the Hydrogen Industry, Customers and the General Public to increase awareness of Fuel Cell technology and encouraging the establishment of Infrastructure









## **MIRAI IN AUSTRALIA - MARKETING & ENGAGEMENT**

- TMCA not actively marketing the vehicle → Building awareness and knowledge of the vehicle technology and the opportunities for hydrogen utilisation
  - Government Federal, State and Local
  - Industry Groups
  - Fleet and Dealership events
  - Universities, Schools and Research Institutes

- STEM Events
- Media
- First Responders (e.g. Police, Fire & Rescue)
- General Public



FEDERAL GOVERNMENT & ARENA



VICTORIAN GOVERNMENT



SOUTH AUSTRALIAN GOVERNMENT



HYDROGEN MOBILITY AUSTRALIA DRIVE



LOCAL COUNCIL EVENTS



TOYOTA DEALERSHIP OPENING



STEM SPARK ENGINEERING CAMP



ENERGY STORAGE CONFERENCE



VACC EVENT



EMERGENCY SERVICES



LOCAL COMMUNITY FESTIVALS



## **MIRAI LOAN PROGRAM**

### Why?

- Continue building on achievements since initial vehicle import in 2015.
- Positive engagement with Government and Industry
- Short Drive Opportunities provide only insights into the technology
- Focus on development of supporting infrastructure
- Normalise Fuel Cell Technology through "real world" usage
- Maintain focus on Mirai (FC) during limited product availability

#### Australian First Fuel Cell Electric Vehicle Trial

• Ten Fuel Cell vehicles in public hands, on public roads

### **Challenges:**

- Refuelling
- Vehicle Importation and Registration

















#### **Some Key Points**

- This is a paid program all participants want to be part of the trial as it supports their environmental & sustainability strategies
- So far, we've travelled over 10,000km using Fuel Cell technology
- Social Media is playing a key role with highlighting the availability of this technology and how it can be used in "daily" life.
- Education & Engagement is important in raising the profile of FCEVs as a viable contributor to reducing transport emissions.

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PROTECTED

## **IS HYDROGEN THE ONLY SOLUTION?**



PROTECTED

### HOW THE MIRAI FUEL CELL SYSTEM WORKS





FC stack generates electricity on demand through a chemical reaction between hydrogen and oxygen. Water vapour is the only emission from the vehicle

H<sub>2</sub>

Hydrogen station

### **REFUELLING THE MIRAI**

- Hydrogen refuelling stations operate similar to that of a conventional petrol station.
- An infrared transmitter near the fuel receptacle communicates with the refuelling station which allows for an efficient fuelling process.
- Once the system checks for a tight seal, fuelling takes approx 3-5 mins
- The filling port is standardised for Fuel Cell vehicles

#### TOYOTA AUSTRALIA'S MOBILE REFUELLER

- Refuel Mirai (and other Vehicles) throughout Australia
- Demonstrate Refuelling Infrastructure/Technology



#### **REFUELLER SPECIFICATION**

Fueling control uni

Tank information

Fuel receptacle Nozzle

Infrared ray transmitter

Communications

functions given to nozzle and fuel receptacle

Pressure

sensor

Hydrogen

Vehicle

Supplier: Compressor Type: Discharge Pressure: Delivery Pressures: Pre-cooling Temp:

**Femperature** 

sensor

High-pressure hydrogen tank

The Linde Group Linear 3-Stage GH<sub>2</sub> Up to 900 bar at 5kg/h 350 bar and 700 bar -20 Deg C

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## **FUEL CELL INITIATIVES IN THE TOYOTA GROUP – Commercial Vehicles**









Fuel Cell technology is "scalable"

#### BUSES

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- Tokyo Metropolitan Dep't of Transportation took delivery of 2x Toyota FC buses in Q1 2017
- March 2018, Toyota launches "Sora" Fuel Cell bus in Japan
- Plans to introduce 100 units prior to 2020 Olympic Games

#### TRUCKS

- Project Portal is a Toyota USA project which demonstrates a Class 8 truck converted to run on Toyota Mirai Fuel Cells
- Toyota USA and PACCAR (Kenworth) agree to develop ten more trucks for an expanded trial
- 7-Eleven delivery trucks in Japan have also been converted to run on Toyota Mirai Fuel Cells





### **TOYOTA AUSTRALIA CENTRE OF EXCELLENCE: HYDROGEN CENTRE**



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## **TOYOTA AUSTRALIA HYDROGEN CENTRE (1)**

#### Formal Announcement – 19/3/19

- Attendance from Government and Industry including
- Federal Energy Minister Angus Taylor
- ARENA CEO Darren Miller
- Toyota VP Sales Sean Hanley
- Strong Media Attendance and Coverage
  - > TV Spots
  - Print Media (Online)
  - Social Media







NEWS OPHION BUSINESS REVIEW NATIONAL AFFAIRS SPORT LIFE TECH ARTS TRAVEL HIGHERE				
Vic Toyota fac	tory becomes hydrogen plant			
vic Toyota lac	tory becomes hydrogen plant			
Y ANGUS LIVINGSTON	An old car manufacturing plant in Melbourne will be transformed into a hydrogen fuel cell production centre to power special vehicles adapted to run on renewable energy.			
ISTRALIAN ASSOCIATED PRESS	en terre en			
UZP'M BHRGH 18, 2019	Toyota's Altona factory will become a renewable energy hub to promote the use of hydrogen to power cars, with a \$3.1 million funding injection from the Australian Renewable Energy Agency.			
	"Hydrogen has the potential to play a pivotal role in the future because it can			
	and the personal of the personal of the second of the seco			
	be used to store and transport energy from wind, solar and other renewable			
	be used to store and transport energy from wind, solar and other renewable sources to power many things, including vehicles," Toyota Australia president Matt Callachor said on Tuesday.			

## **TOYOTA AUSTRALIA HYDROGEN CENTRE (2)**

#### WHAT IS IT? WHY ARE WE DOING IT?

• Seed the Hydrogen Economy in Australia





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# Thank You.

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