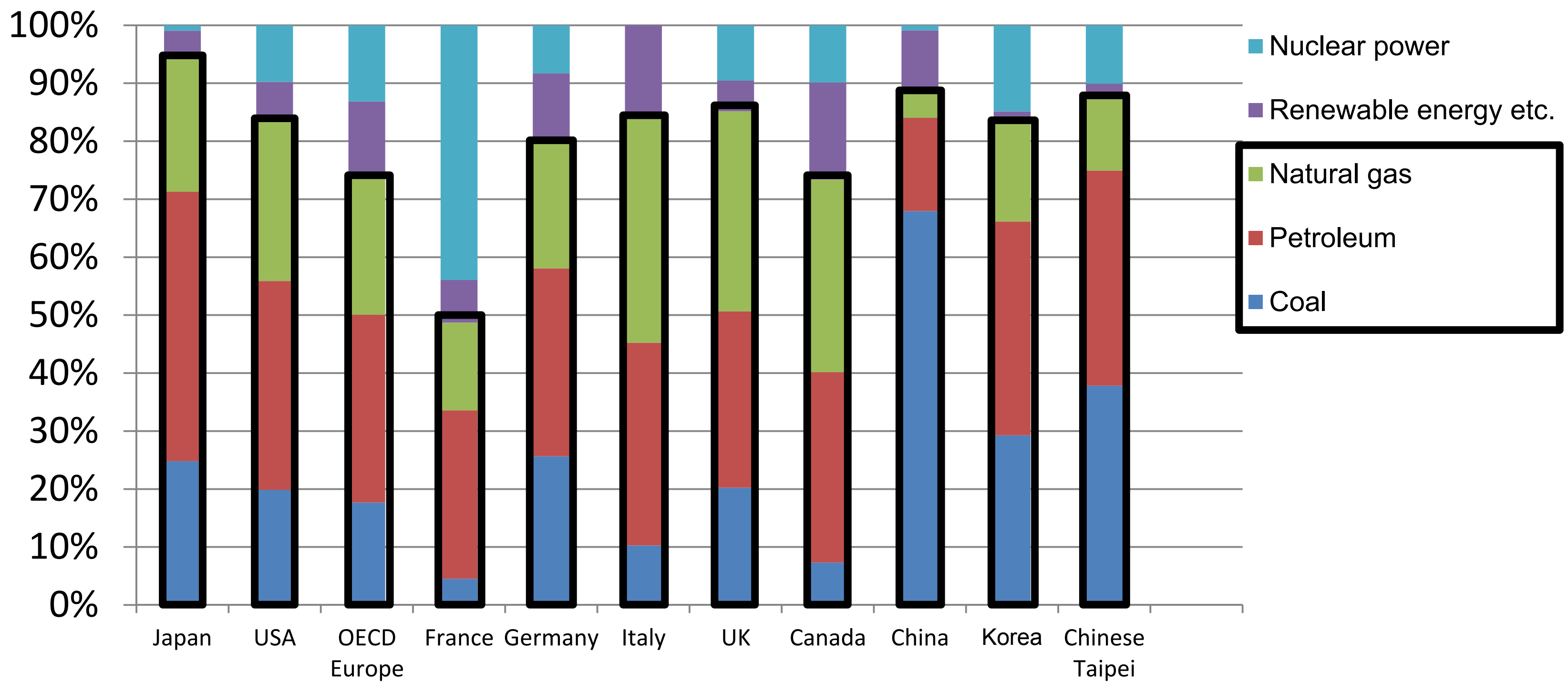
Toyota Media Tour 2015 Tokyo Motor Show

Part 1
Achieving a hydrogen-based society

1-(1). Energy use at present

1. Worldwide state of primary energy consumption (as of 2012)

Source: IEA

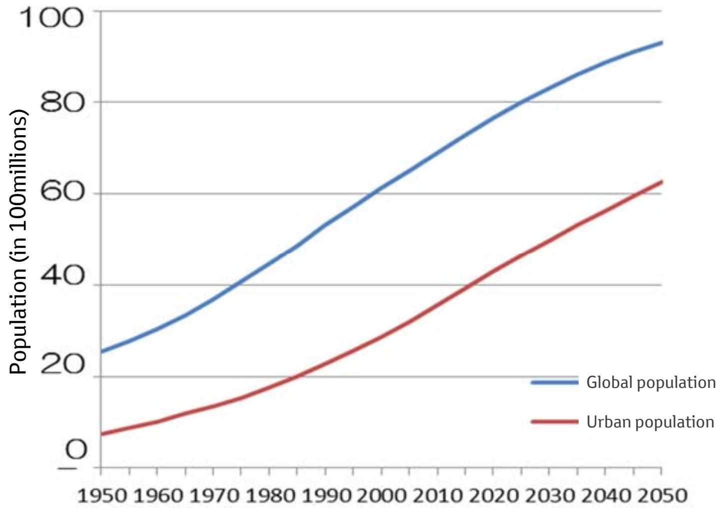


Most countries rely on non-renewable fossil fuels

2. The world in 2050 (1)

■Global and urban population

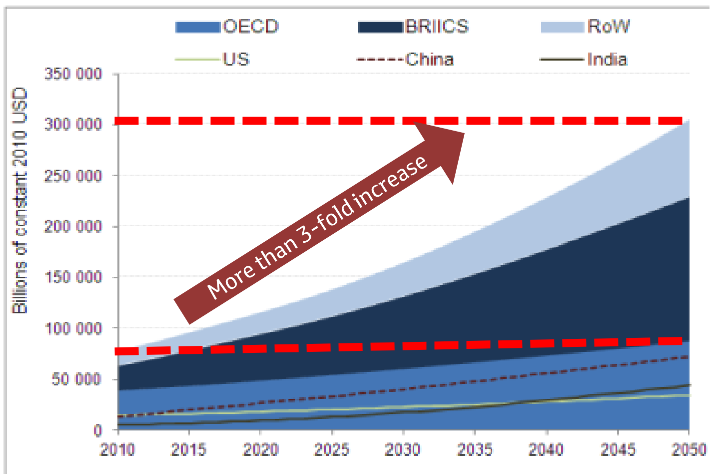
Source: U.N. Dept. of Economic and Social Affairs



- Global population of 9.6 billion
- 70% of the world's population living in cities

■Global GDP

Source: OECD Environmental Outlook

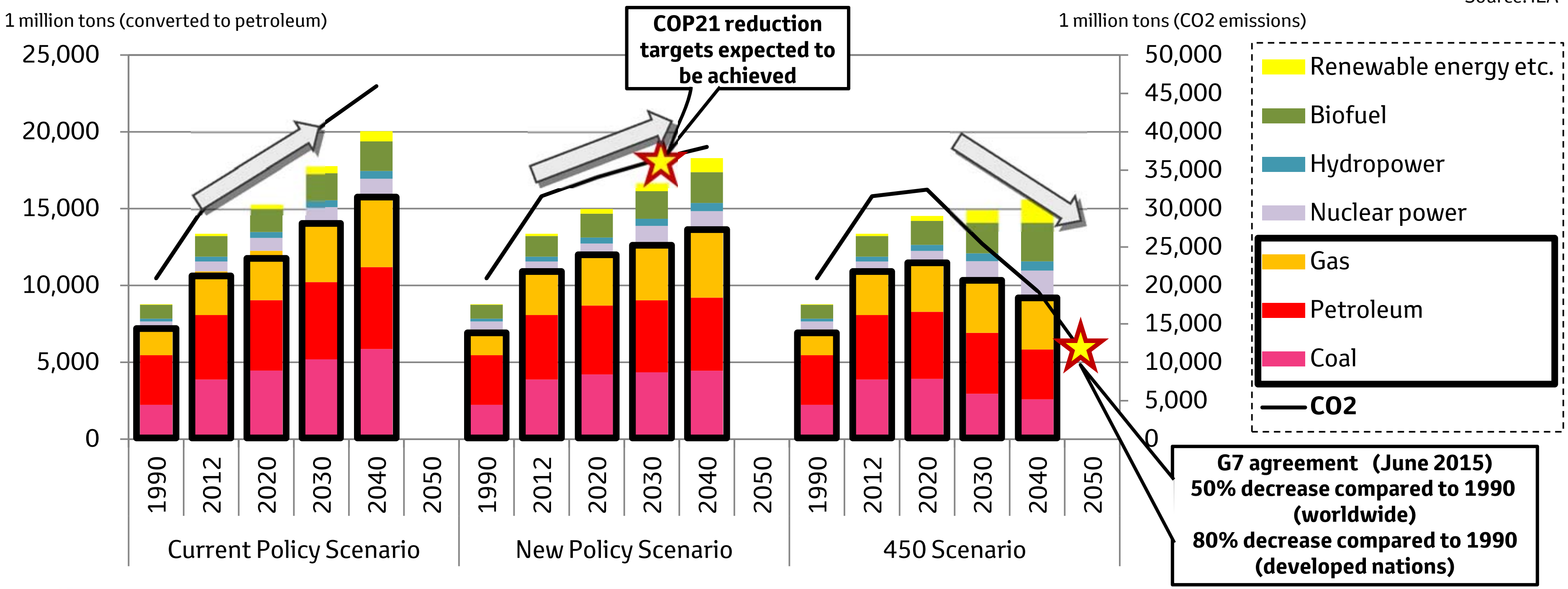


- Global GDP to increase more than threefold

Rapid increase in overall/urban population and economy leading to Intensified environmental problems (climate change, global warming, air pollution)

3. The world in 2050 (2) (expected CO_2 emissions)

Source: IEA



Increasing use of fossil fuels is expected to lead to increased CO2 emissions. As things are, it will be difficult to achieve the CO2 emissions reduction targets agreed to at the G7 meeting in June 2015.

4. Toyota's hope: A sustainable mobility society

1—(2). Hydrogen as an automotive fuel

9. Advantages of hydrogen

- Zero CO_2 emissions during use, helping to achieve a low-carbon society

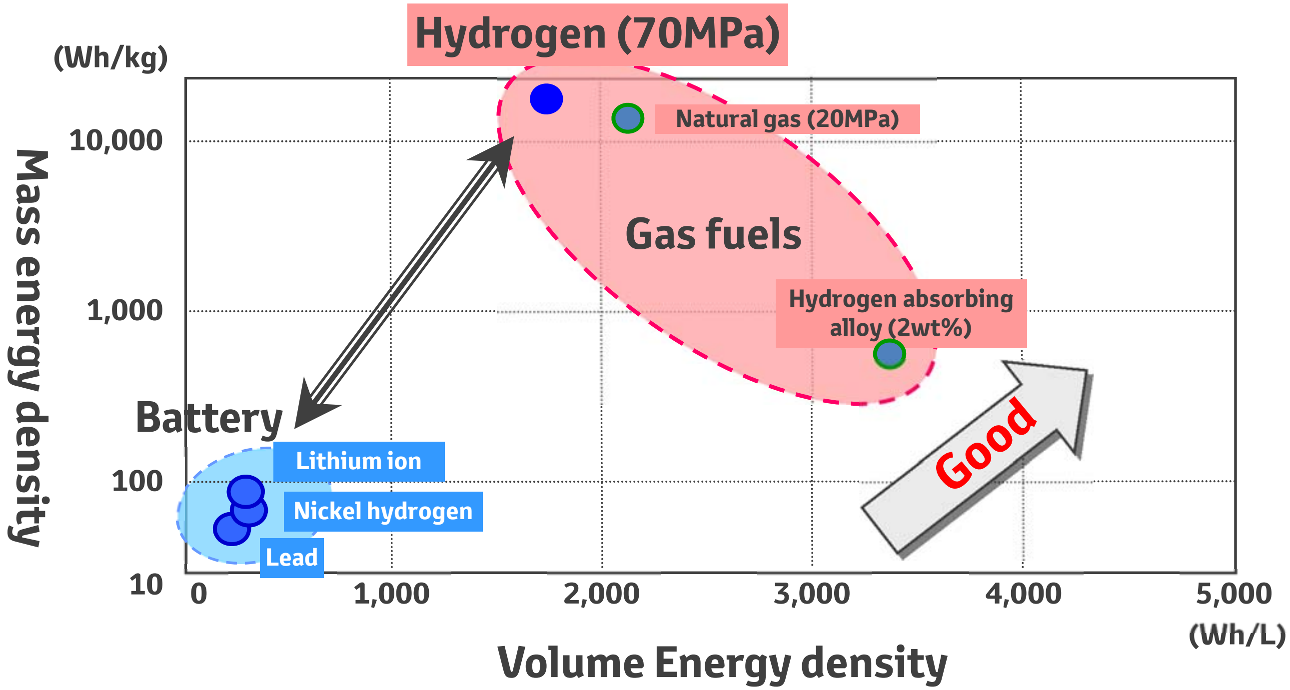
- Can be obtained from a variety of primary energy sources
  - From fossil fuels such as natural gas, as well as from unused sewage sludge
  - From water using natural energy sources such as solar or wind energy

- Higher energy density than batteries, and is easier to transport and store;
  can be used to resolve uneven distribution of regional energy,
  and to compensate for fluctuations in supply from renewable energy sources

- Wide range of uses, from home to automotive fuel and power generation

10. Energy density of electricity and compressed hydrogen

Toyota calculations



Hydrogen's volume energy density is roughly seven times higher that of batteries

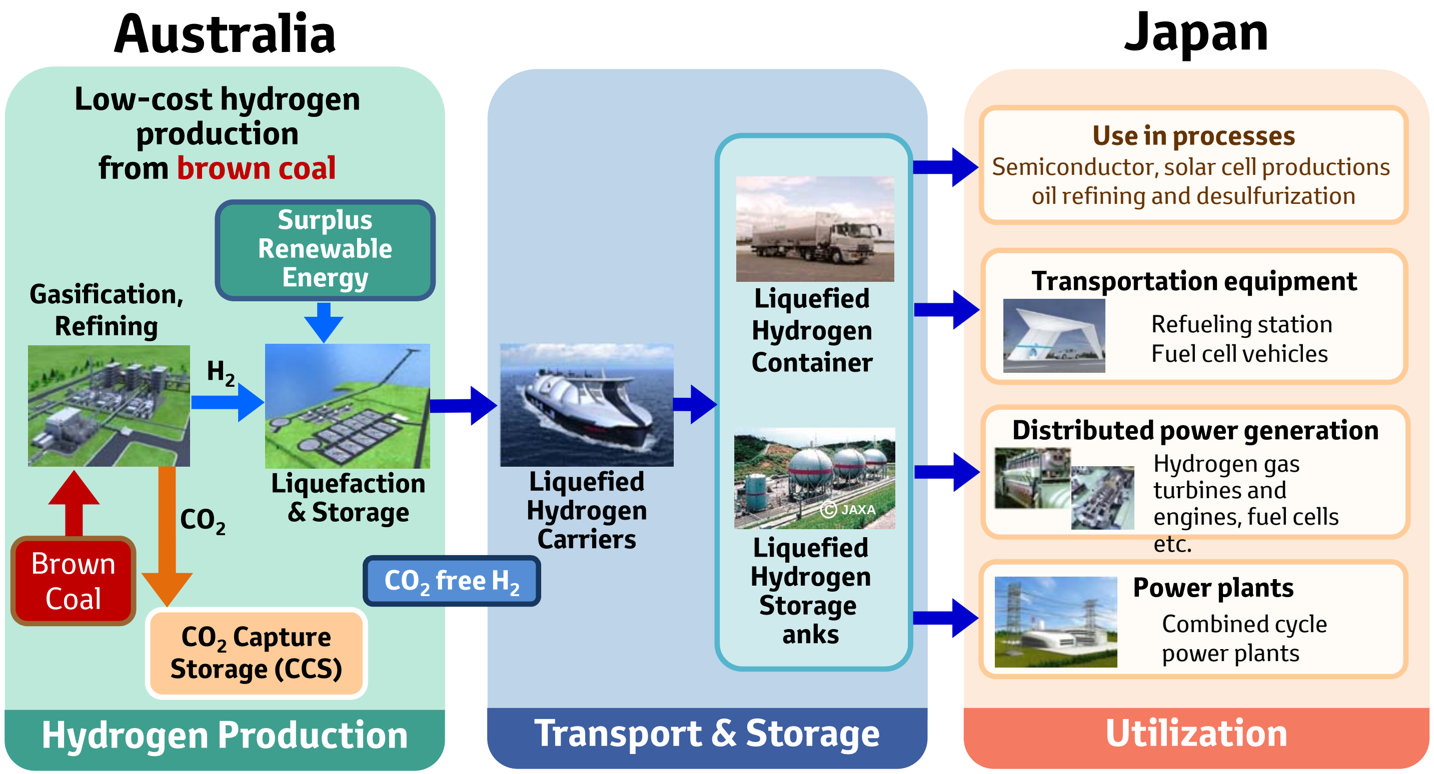
1－(3). Initiatives to achieve a hydrogen-based society

11. Methods of producing hydrogen

	Energy source	Production method	Well-to-wheel*1 CO2 emissions comparison
Production of hydrogen	Natural gas	Reformation with high-temperature vapor	**Poor to Adequate**
	Water electrolysis	Water electrolysis using electricity	**Poor to Excellent** (grid power vs. renewable energy)
	Brown coal	Gasification and reformation of brown coal	**Poor to Excellent** (depending on use of CCS*2)
	Sludge	Reformation of methane gas produced by sewage sludge	**Good to Excellent**
Byproduct hydrogen	Coke oven gas (iron and steel)	Byproduct hydrogen emitted in the coking refining process	**Poor** (no alternatives*3)
	Salt electrolysis (sodium hydroxide)	Byproduct hydrogen produced while manufacturing sodium hydroxide through salt electrolysis	**Good** (no alternatives*3)

*1: “Excellent” or “Good” ratings can be taken to mean “superior to hybrid vehicles”
*2: Carbon dioxide capture and storage
*3: Byproduct limits, excluding cases where alternative fuels are required for hydrogen removed from the boiler

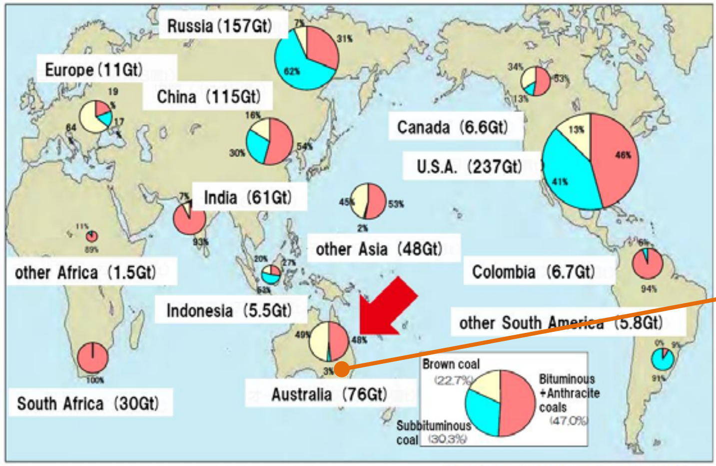
- Stable hydrogen supply with CO_2 emission suppression (Around 2025)
- Basic design is on going for trial in 2020 as a national (NEDO) project



13. Kawasaki Heavy Industries: Brown Coal

- Vast deposits in the world, younger than black coal
- High moisture content（50%-60%）
- Difficult to transport due to spontaneous ignition
- Locally used for coal thermal power generation
- Difficulty of transportation means no trade, and “unused resource” status. As a result, brown coal is cheap.
- Hydrogen can be produced at low cost

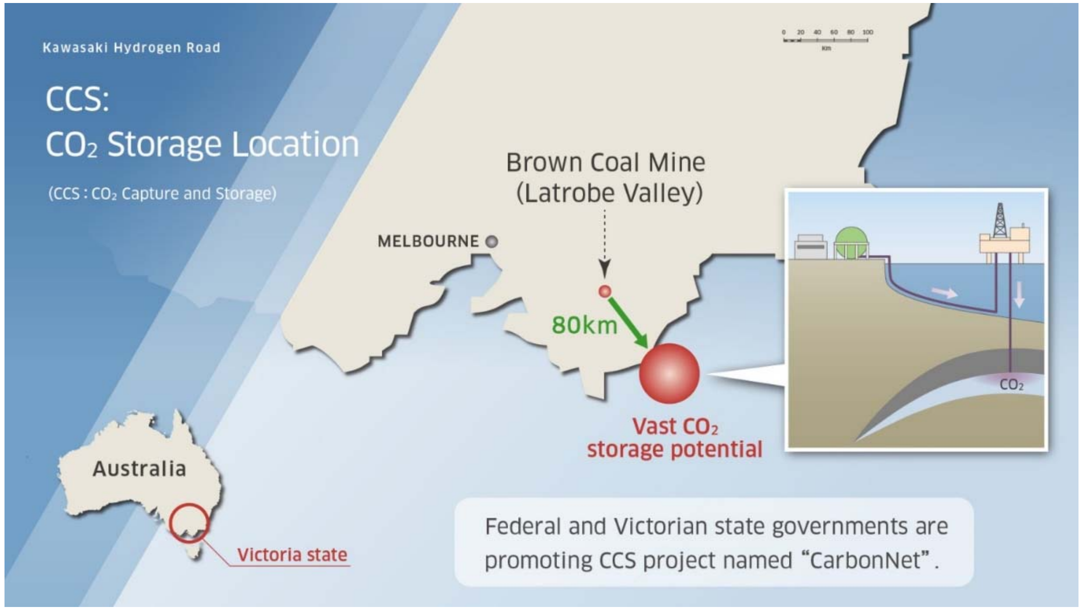
Australian Brown Coal



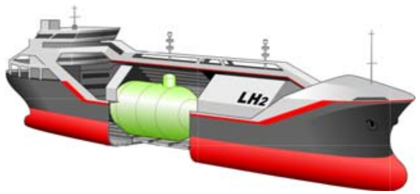
WEC, " Survey of Energy Resources 2010"

Impact of CO2-free Hydrogen Supply Chain:

- Substantially CO2-free by linking with CCS(CO2 capture and storage)
- Basic technology for hydrogen transport from Australia to Japan will be established via trial supply chain and other ongoing developments.
- More affordable hydrogen than at present(8$/kg)will be supplied in the future



Hydrogen liquefied from gas at -253℃(1/800 volume)



Liquid hydrogen transported by a carrier ship with highly insulated tanks

15. Hydrogen leader city project: Hydrogen production using a sewage biogas source

Demonstration of hydrogen generation from a sewage biogas source
(Project commissioned by Ministry of Land, Infrastructure, Transport and Tourism and NILIM)

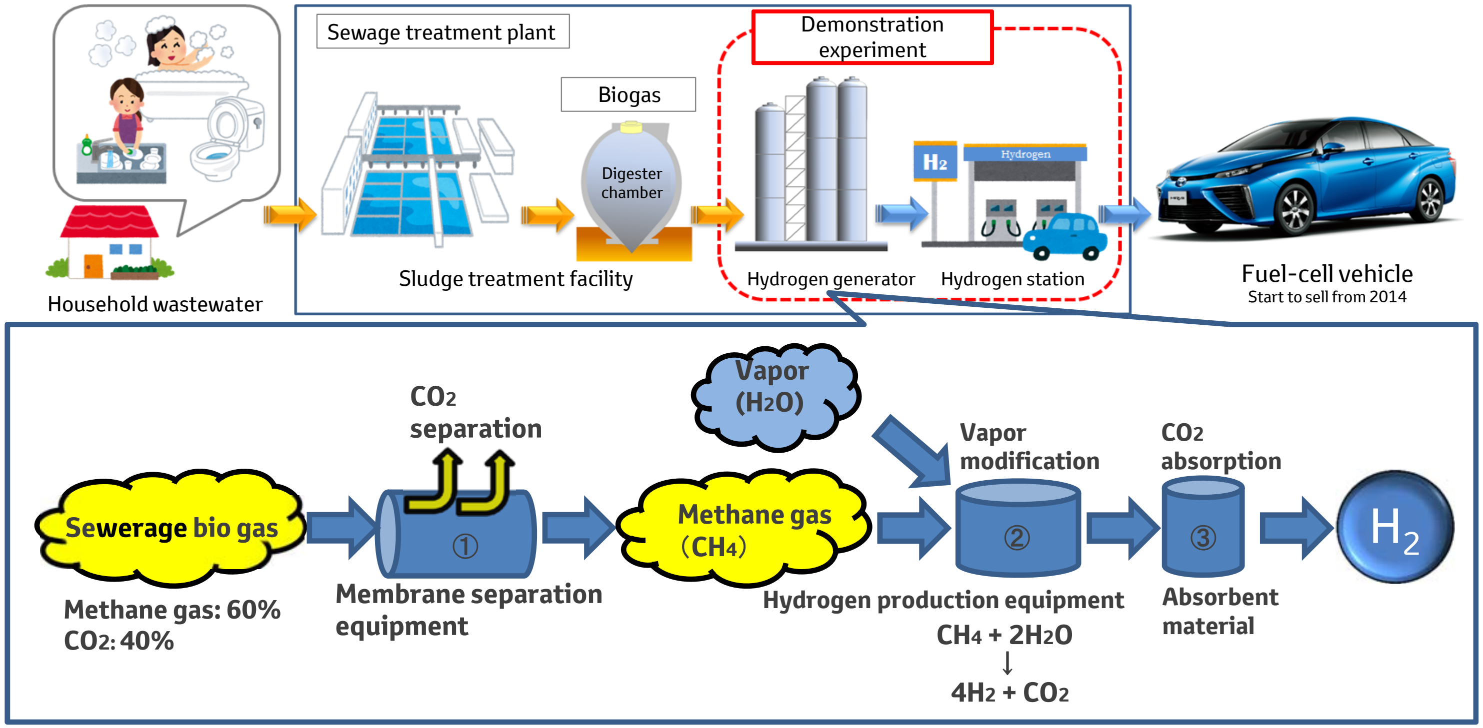
Implemented by: Consortium between Mitsubishi Kakoki Kaisha, Fukuoka City, Kyushu University and Toyota Tsusho Corporation
Trial site: Fukuoka City Central Water Processing Center
Trial content: Performance assessment of hydrogen production equipment, quality evaluation of supplied hydrogen, energy creation effects

Hydrogen stations

Overview of hydrogen manufacturing facilities

Plant capacity is approx. 300 kg/day (approx. enough to power 65 Mirai vehicles/day); installation of sewerage processing facilities possible

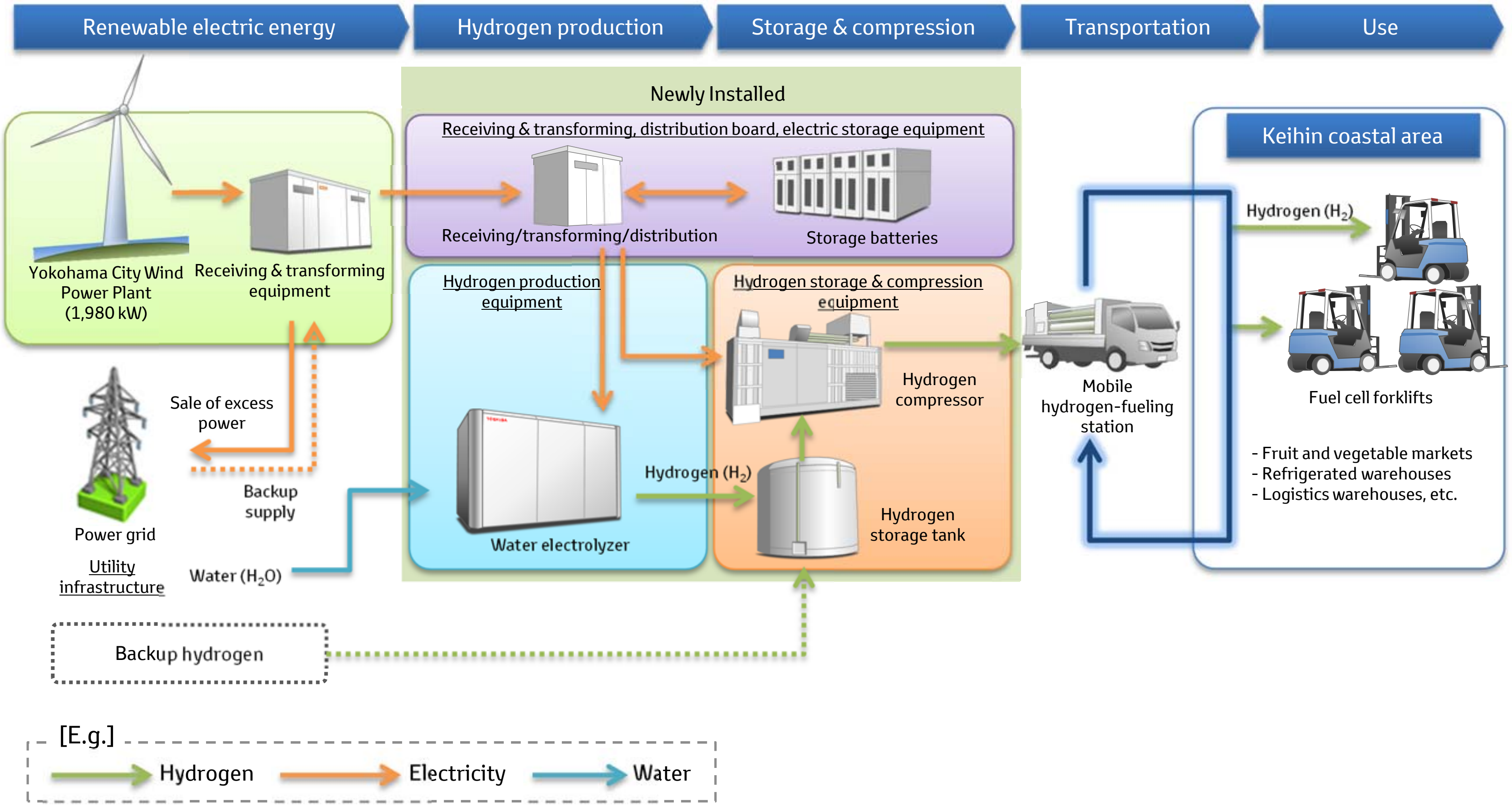
16. Hydrogen leader city project: production using sewage bio gas



Hydrogen production possible with close to zero CO2 emissions using sewerage bio gas that would previously have been burned and disposed of

17. Production using wind power in Hamburg, Germany

18. Production and usage utilizing wind power (Yokohama PJT)



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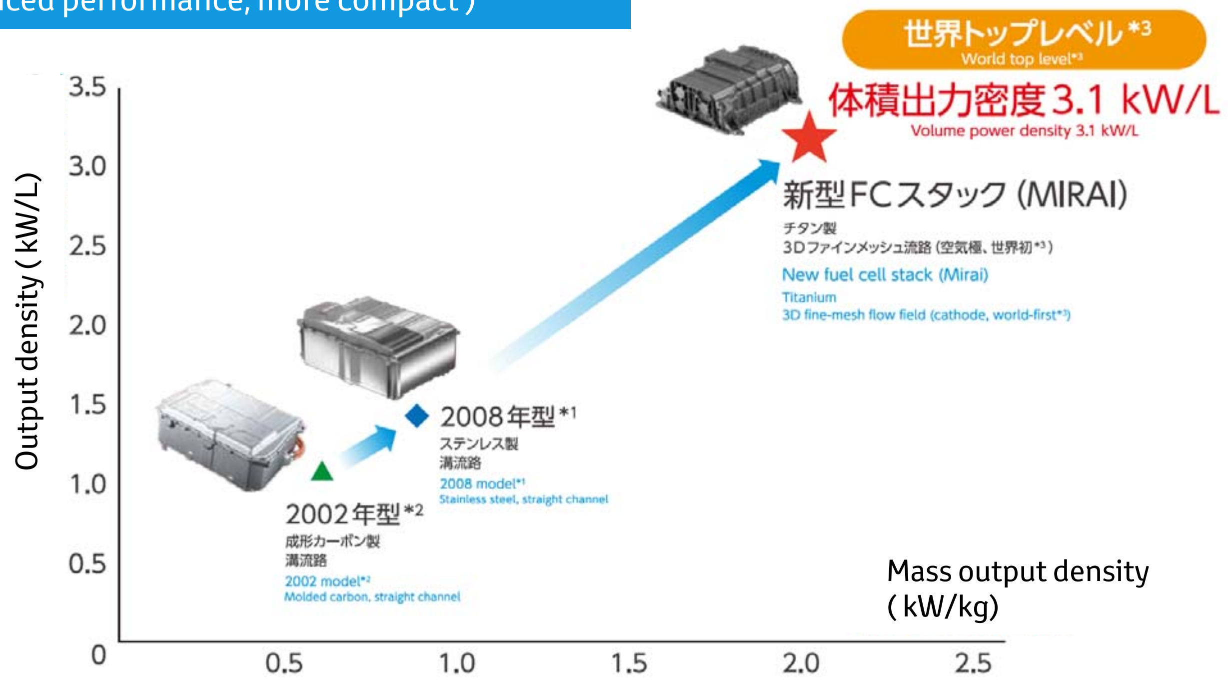
Part 2
The Toyota Mirai

2-(1). Toyota fuel cell system (Toyota FC system)

1. Fuel Cell Stack

New fuel cell stack with increased output density
(enhanced performance, more compact)



Improved fuel cell performance and reduced size

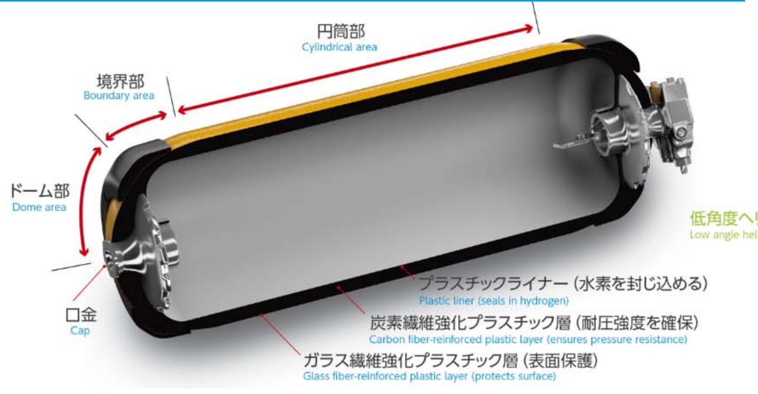
3. High pressure hydrogen tank

Lighter weight achieved thanks to use of carbon fiber reinforced plastic layer structure
Tank storage density of 5.7 wt% achieved, a world-leading level*2

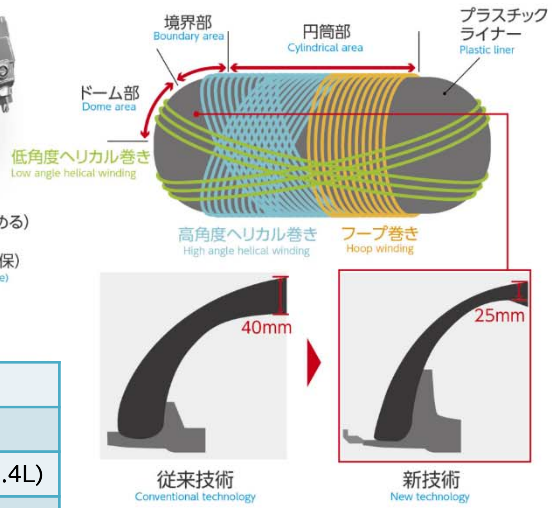
世界トップレベル*2
World top level*2

プラスチックライナー形状の改良と積層パターンの効率化により炭素繊維使用量を約40%低減

Innovations to the plastic liner configuration and efficient layering pattern resulted in a reduction of approximately 40% in the amount of carbon fiber used



高圧水素タンク High-pressure hydrogen tank



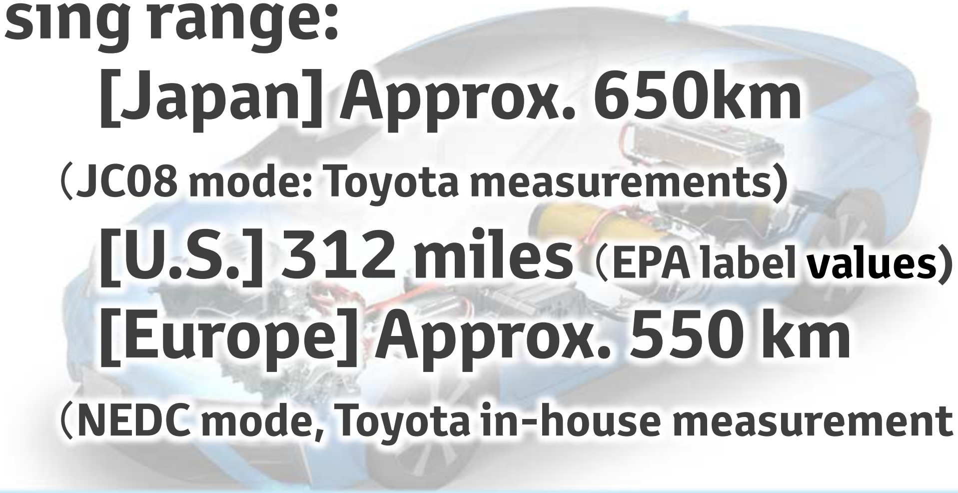
Nominal working pressure	70 Mpa (approx. 700 bar)
Tank storage density	5.7 wt% (world top level*2)
Tank internal volume	122.4L (front tank:60.0L, rear tank: 62.4L)
Hydrogen storage mass	Approx. 5.0 kg

*2：2014年11月現在　トヨタ調べ　*2 As of November 2014, Toyota measurements

Reduced costs and improved performance

Fueling time: Approx. 3 – 5 min.

Cruising range:



[Japan] Approx. 650km

(JC08 mode: Toyota measurements)

[U.S.] 312 miles (EPA label values)

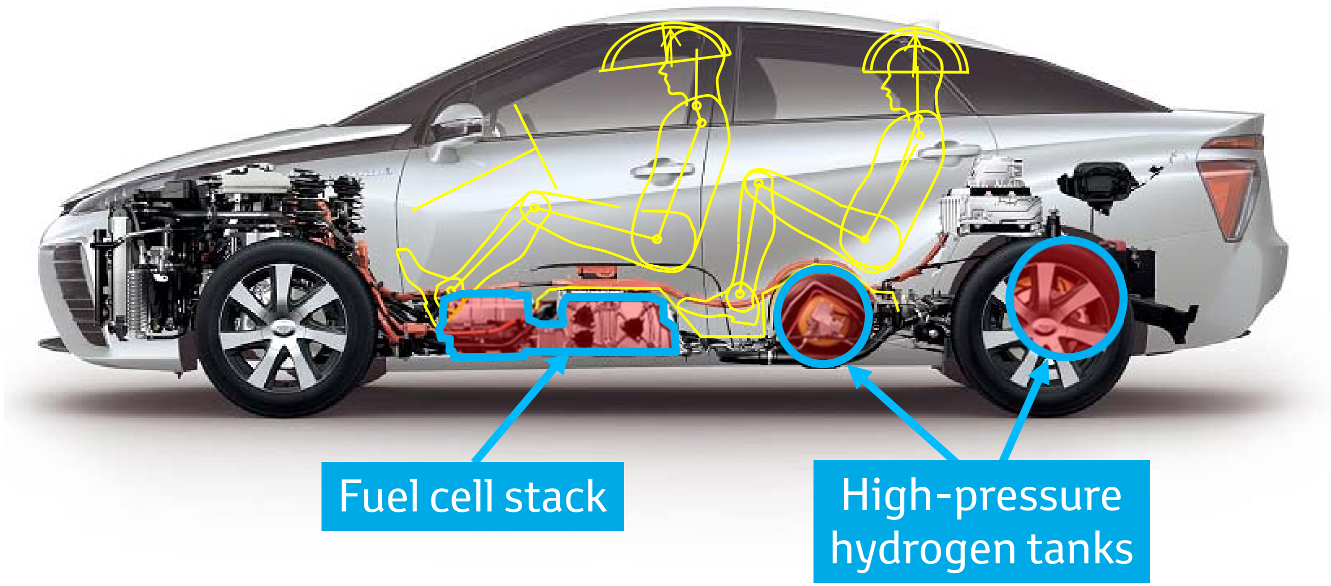
[Europe] Approx. 550 km

(NEDC mode, Toyota in-house measurement values)

Short fueling time and long cruising range: user-friendliness equivalent to gasoline-engine vehicles

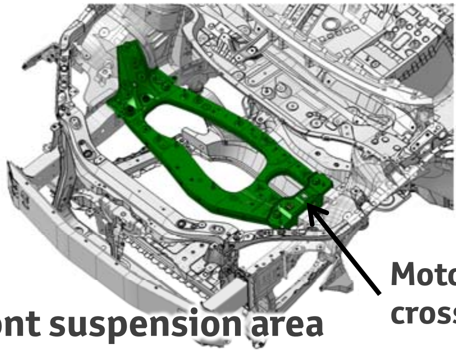
2-(2). Quiet, responsive drive offered by FCVs

4. Low center of gravity, optimal distribution of weight

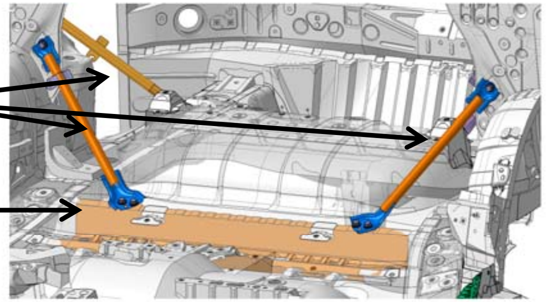


Positioning the fuel cell stack and tanks under the floor gives a low center of gravity and optimal distribution of weight

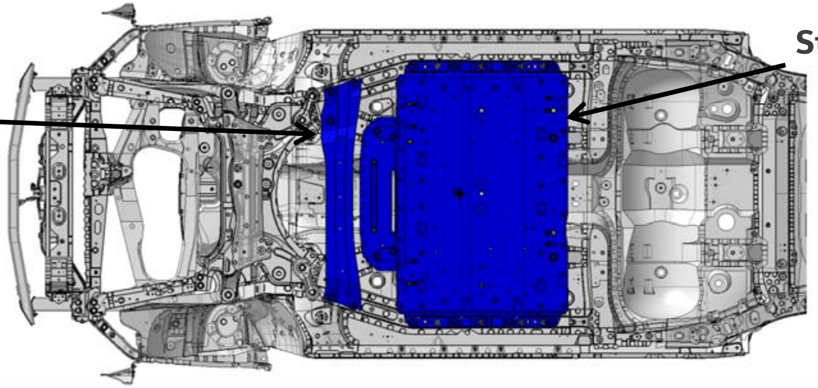
5. High rigidity body



Front suspension area



Rear suspension area



Improved torsional rigidity
(40%-60% higher than Toyota front-wheel drive vehicles)

2-(3). New functions unique to FCVs

6. Large capacity external power supply system

FCスタックで発電した電力を電源として利用することが可能です。

The electricity generated by the fuel cell stack can be used to provide external power.

車両のCHAdeMO端子に直流／交流変換の給電器を接続することにより住宅や電気製品に給電できるDC給電と、走行中も便利に電気製品が使えるAC給電があります。災害などの停電時に活用が期待されています。

By connecting a DC/AC converting power supply unit to the vehicle's CHAdeMO terminal, it is possible to supply DC power for homes and electrical products. Also it is possible to supply AC power for convenient use of electrical products while driving. The power can be used in the event of power outages, including during disasters.

MIRAIから供給可能な電力量は約60kWh*1で、最大9kW*2の電力供給が可能

The Mirai has power output capacity of approximately 60 kWh*1. Its maximum power output is 9 kW*2.

*1 給電器でDC/AC変換後の値。給電器の変換効率、水素残量、消費電力により給電可能な電力量は異なる。 *2 接続する給電器の性能により、給電可能な電力は異なる（給電器の能力以上に給電することはできない）。

*1After DC/AC conversion by power supply unit. Power supply capacity varies according to power supply unit conversion efficiency, amount of remaining hydrogen and power consumption.

*2Power supply capability varies according to power supply unit specifications (amount of power supplied cannot exceed power supply unit specifications)

供給電力量

約60kWh*1

Amount of power output: approx. 60 kWh*1

最大供給電力

9kW*2

Maximum power output: 9 kW*2

7. A new society based on electricity and hydrogen

Convert renewable energy into hydrogen before storing and transporting it

Enabling a hydrogen-electricity power grid

Factsheet: Production capacity increase

Toyota received 1,500 orders for the Mirai in the model's first month on the Japanese market. We decided to increase production capacity to meet demand.

2015: Approx. 700 units/year

2016: Approx. 2000 units/year

2017: Approx. 3000 units/year

Factsheet：Sales plan

Japan:
Release for sale on December 15, 2015

U.S.: Over 3,000 units by end of 2017
Launched on October 21, 2015 (California)

Europe: Approx. 50 – 100 units/year
Launching as of Q4, 2015
(U.K., Germany, Denmark)

Factsheet: Wide-ranging initiatives in the Toyota Group

FCV Mirais

FC buses

Introduction will start in fiscal 2016 mainly in Tokyo. Preparations underway for at least 100 units in line for the 2020 Tokyo Olympics and Paralympics

FC forklifts

Household fuel cell systems

Power generation efficiency: 46.5% (world-leading level)

Launched in April, 2012

Osaka Gas, Kyocera, Chofu Seisakusho