

*For the Establishment of Hydrogen Production Business
with Local Biomass*

- Challenges of BLUE Projects starting in Local Areas -

Japan Blue Energy Co., Ltd.

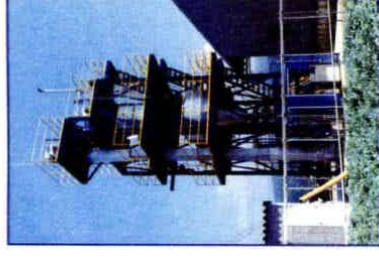
JBEC

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株式会社ジャパンブルーエナジー
Japan Blue Energy Co., Ltd.

1. Overview (as of June 30, 2015)

Corporate Name	Japan Blue Energy Co., Ltd.
Foundation	May 1, 1975
Representative	Naoki Dowaki, President
Head Office	4F Kioicho Tsuruya Building, 3-20 Kioicho, Chiyoda-ku, Tokyo
Shibukawa Technology Development Center	2523-43 Kamishiroi, Shibukawa-city, Gunma
Capital	901,130,000 Japanese yen



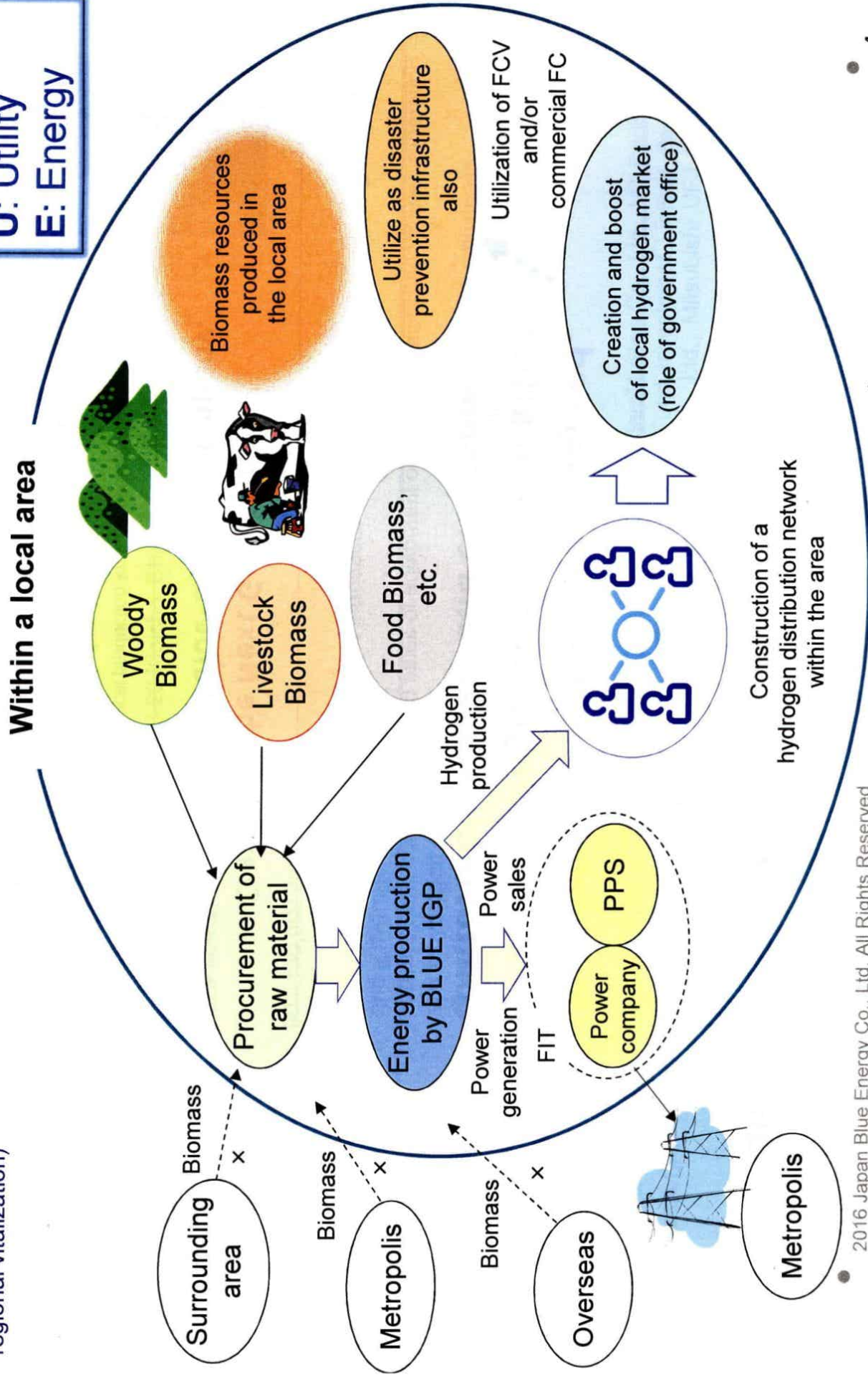
- Description of Business
- Research, study, and engineering for introduction of biomass gasification power generation and a hydrogen collection plant.
 - Procurement, construction, and sales of equipment of biomass gasification power generation and a hydrogen collection plant.
 - Operation and maintenance of the biomass gasification power generation business.
 - Operation and maintenance of the biomass hydrogen production business.

- Affiliate companies
- Global Blue Engineering Co., Ltd. (吉倍克工程股份有限公司)
 - Three SPCs including Wajima Blue Energy Co., Ltd.

- Major Shareholders
- Naoki Dowaki, TOYO-KENSETSU Corporation, Fuyo General Lease Co., Ltd., MT Partners Co., Ltd., Kokyo Tatemono Co., Ltd., Collabo Sangakukan Fund Investment Limited Partnership, TODA CORPORATION, Nomura Research & Advisory Co., Ltd., Mitsubishi UFJ Capital Co., Ltd., and Others.

2. Basic Concept

- Construction of local production for local consumption type hydrogen infrastructure - (Produce a circulation of "resource", "energy" and "wealth" in a local area for the regional vitalization)



Corporate Philosophy

Corporate Philosophy

**New value is created with advanced,
original technologies to realize an affluent,
comfortable society and environment.**

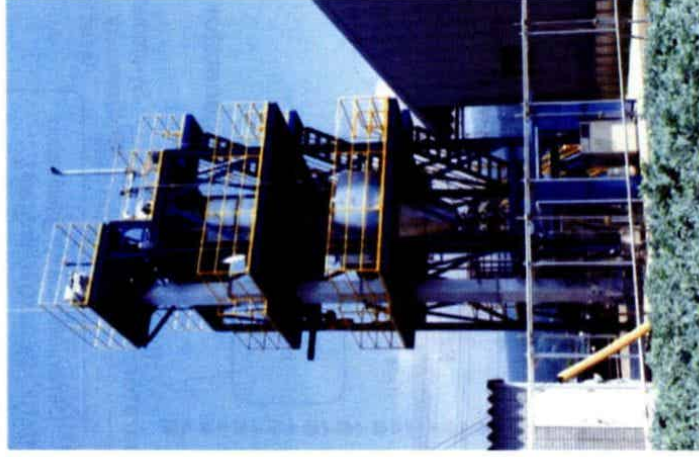
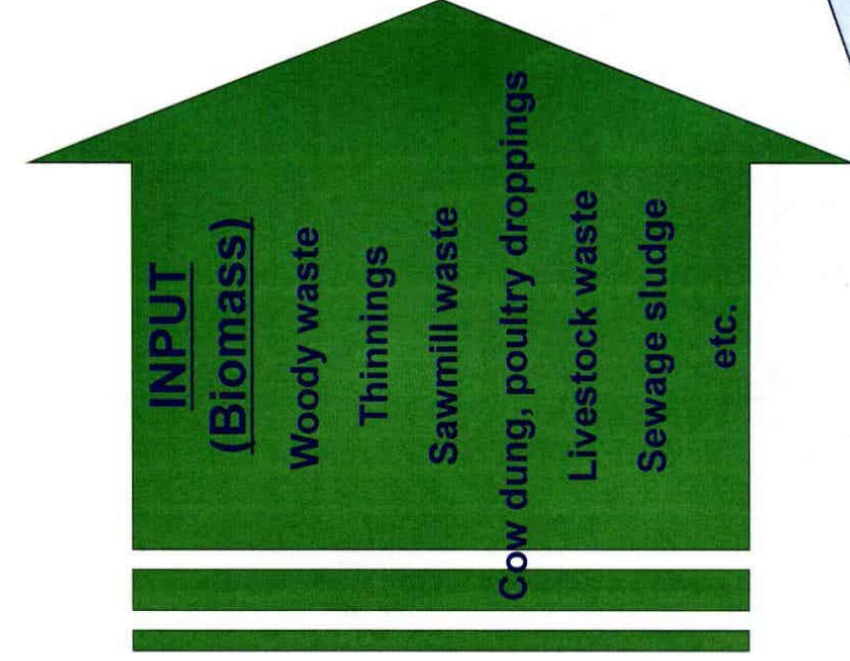
Corporate Statement

**Create for the Next Generation
as an independent, value-creating company.**

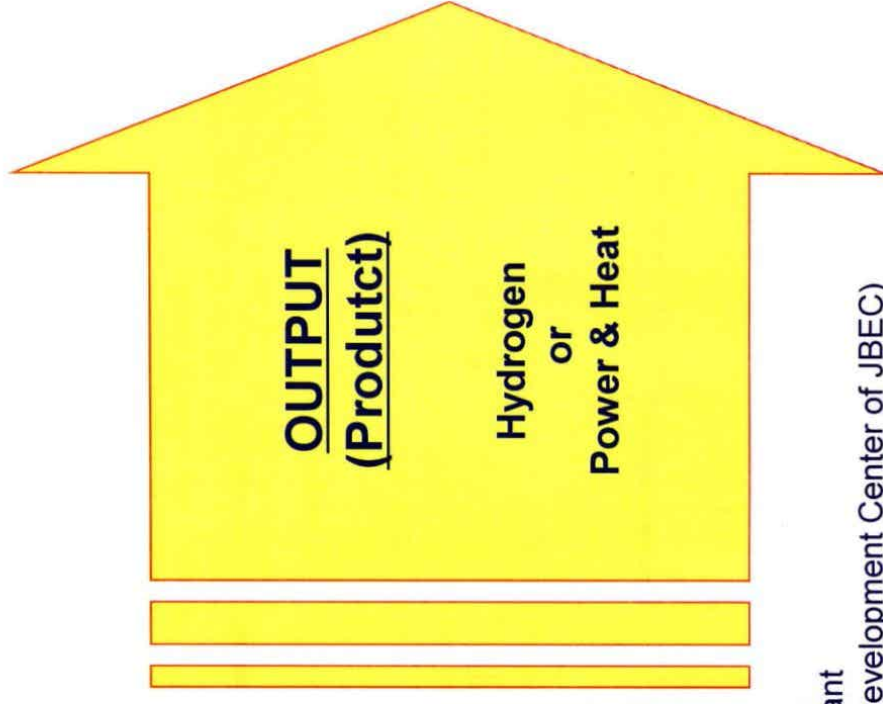
- We intend to independently create a hydrogen energy market of local production for local consumption.
- We intend to independently create new value from local energy infrastructures.
- Each one of our employees is aware of our goals and works to create new value through their jobs for the next generation.
- We hope our achievement in the respective businesses becomes assets of the earth in the future.

3. Core Technology

3-1. Base Frame

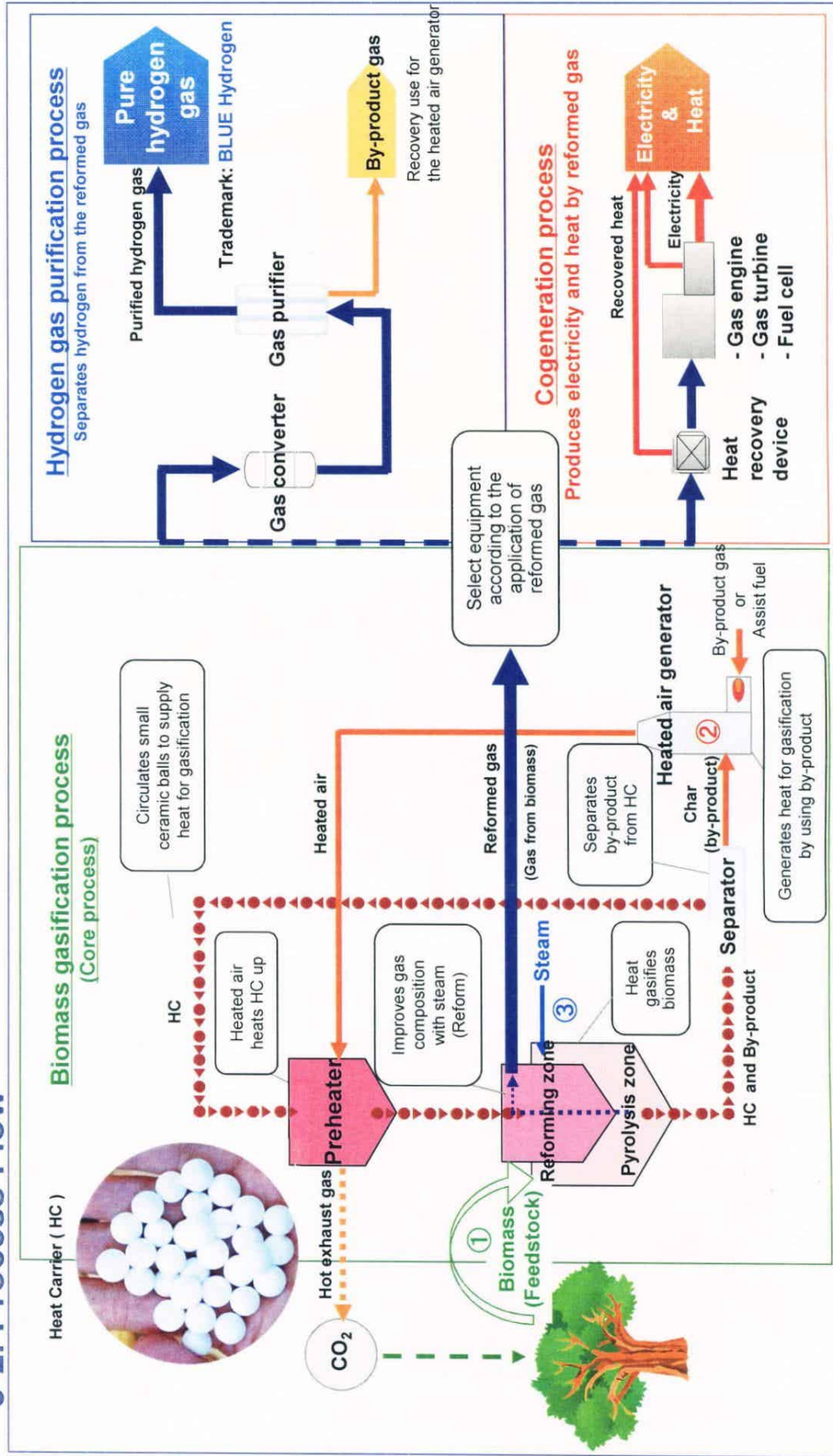


BLUE IGP – Third pilot plant
(Shibukawa Technology Development Center of JBEC)



- Carbon-Neutral energy production system (Fossil fuels is NOT required)
- Relatively small-scale distributed power source with various kinds of raw materials.
- No special skill for operation is needed due to simple configuration and low operation pressures.
- Gasification under steam atmosphere produces utilized syngas

3-2. Process Flow



Reformed gas (Hydrogen rich gas) =

① Biomass + ② Heat + ③ Water

Hydrogen energy from biomass
⇒ Biomass power generation
Biomass heat utilization

Demonstration Plants

First Demonstration Plant
(Anan, Tokushima Pref.:
Completed in 2005)



Second Demonstration Plant
(Izumo, Shimane Pref.:
Completed in 2006)



Izumo Technology Development Center of JBEC

Reference

State of the art technology: IGP

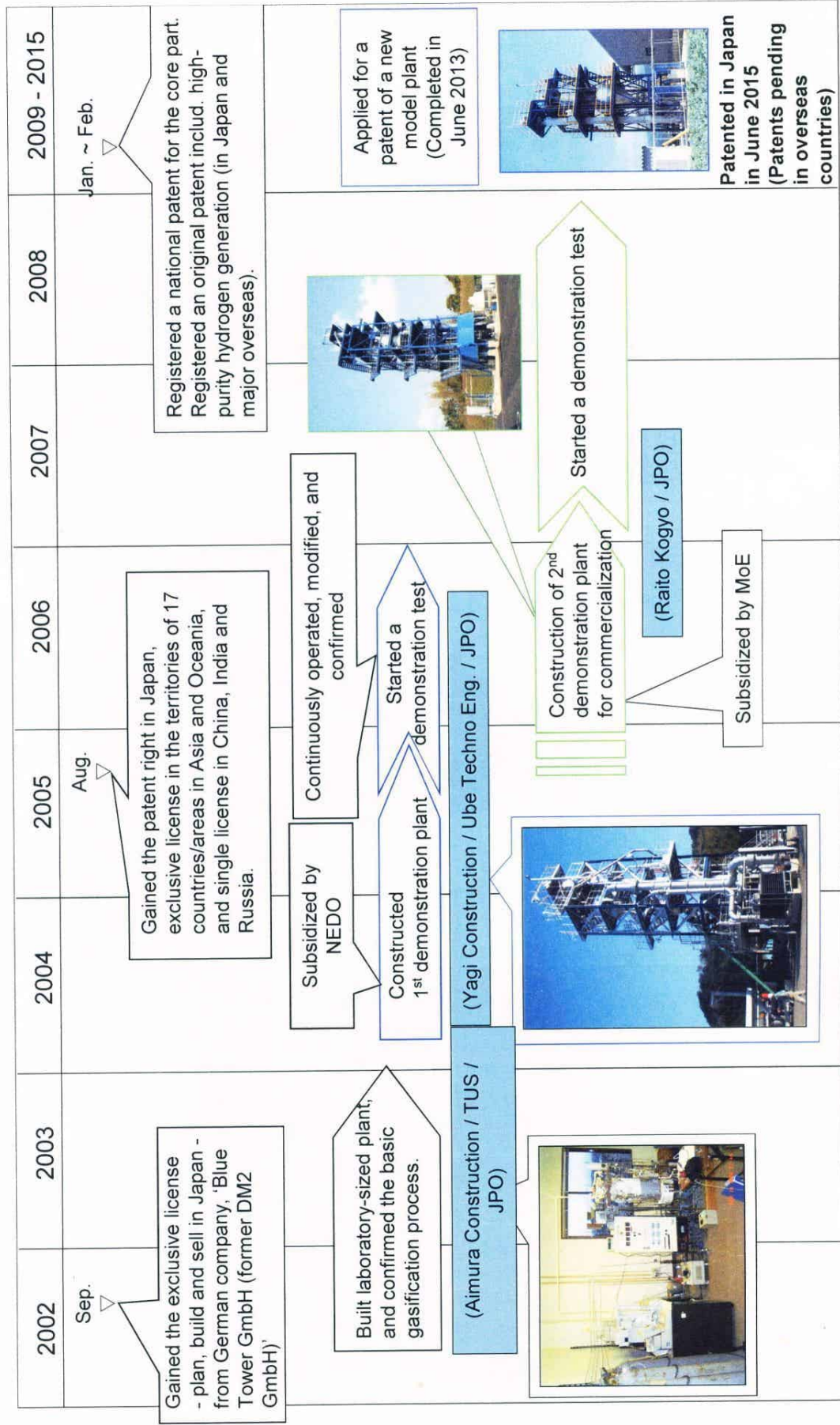
Innovative Gasification Plant

Third Demonstration Plant
(New two vessel model)
(Shibukawa, Gunma Pref.:
Completed in June 2013)

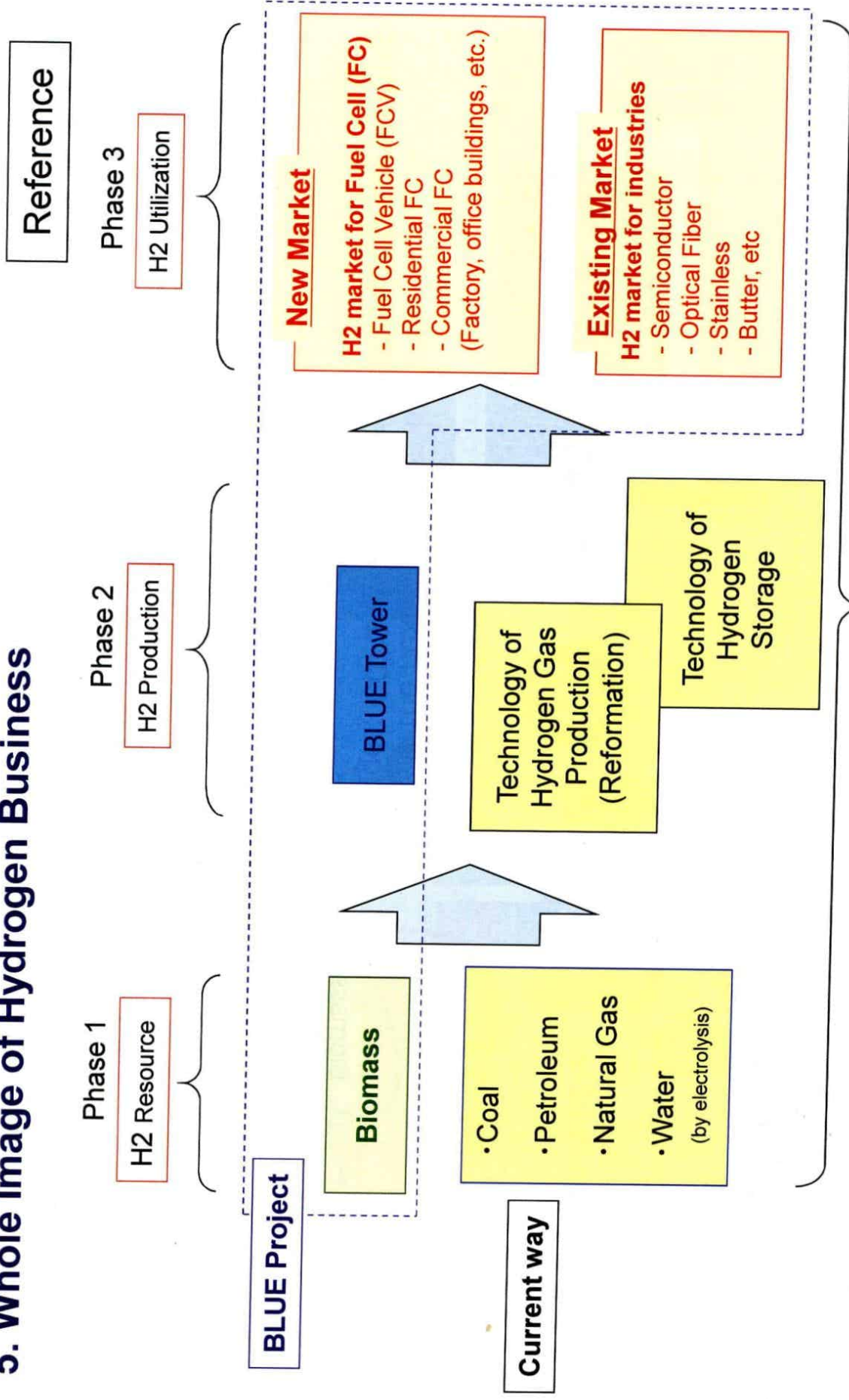


IGP (New model) of JBEC

4. History of Development



5. Whole Image of Hydrogen Business

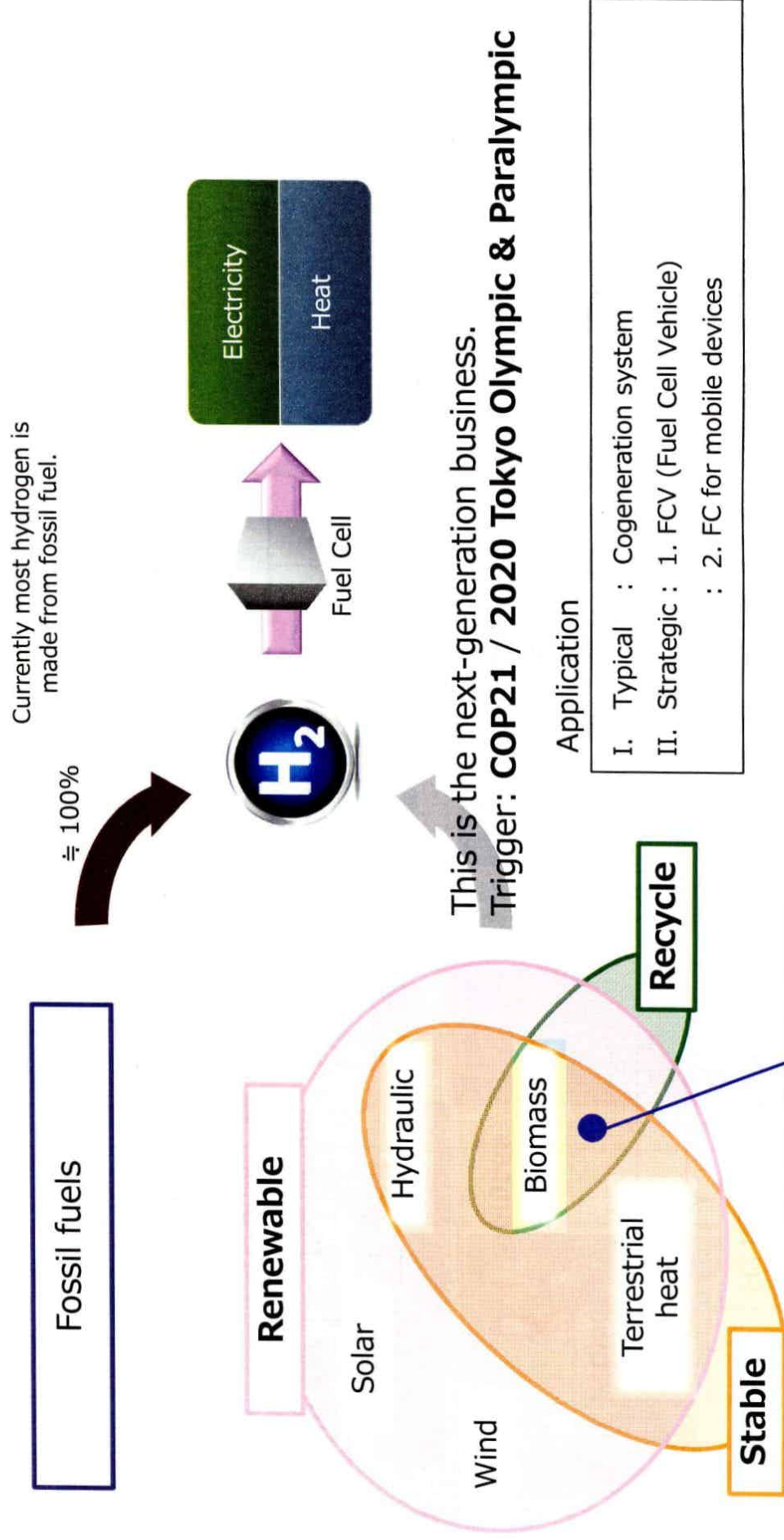


Presently, there is no commercial-level technology to produce hydrogen from biomass except the one we have. When the era of hydrogen economy comes, we expect it will be fairly high value-added "biomass hydrogen supply business".

Also, interest in biomass hydrogen has been rapidly growing in the existing industrial hydrogen market due to its users' needs such as CO2 reduction.

6. Hydrogen market trend in Japan

6-1. The hydrogen society with the Fuel Cell has come

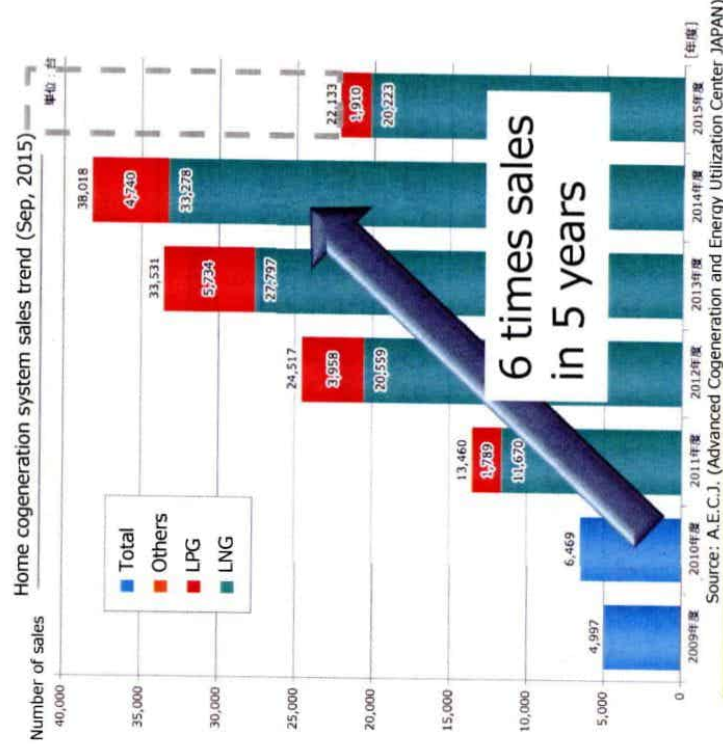


6-2. Cogeneration system

Lighting and shower with Hydrogen

- For Home

Sales volume increased six-fold in five years, government subsidies boost.



- For Community and Office



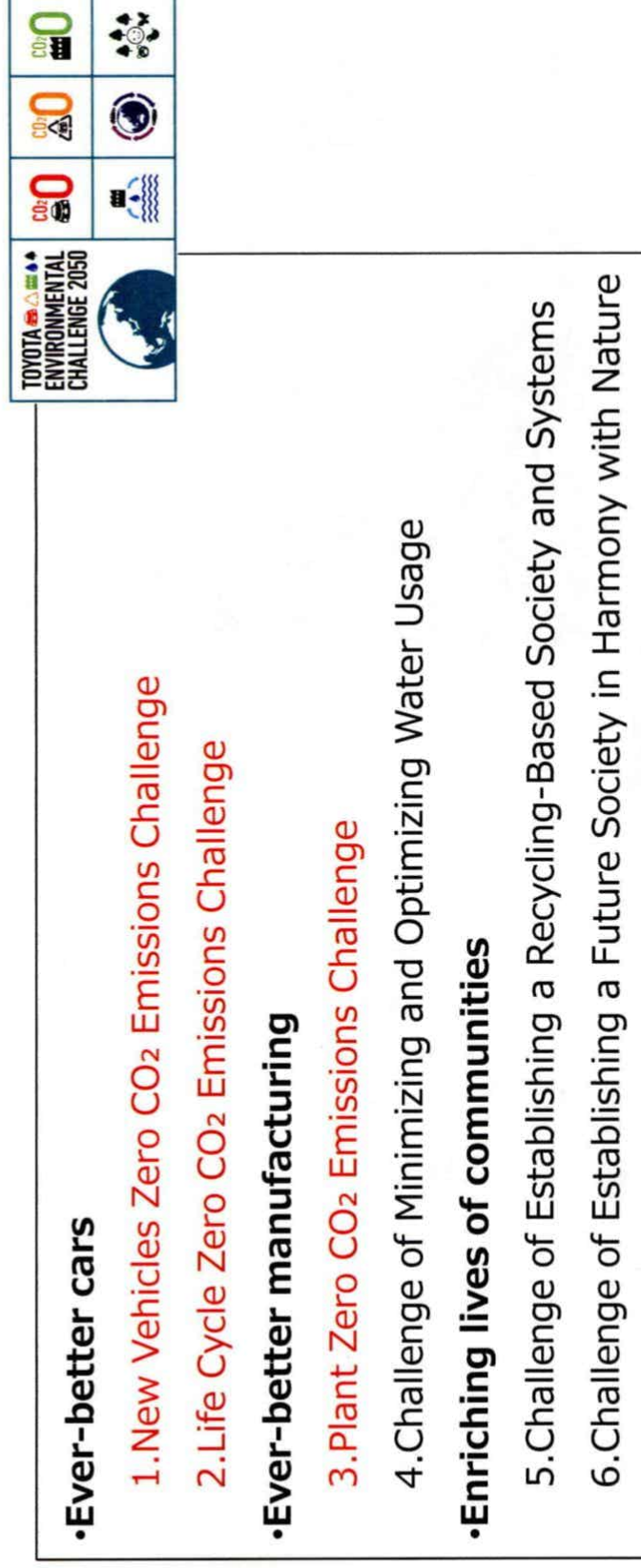
Bloom Energy high efficiency cogeneration system for office power supply.



TOSHIBA independent energy supply system:

- "H₂One" combination of
 - solar power generation systems
 - storage batteries
 - hydrogen electrolysis
 - hydrogen tank
 - fuel cell

TOYOTA Environmental challenge 2050



(Source: TOYOTA web site)

Contribution to the hydrogen society

By utilization of renewable energy and CO₂-free hydrogen, we develop the future which is symbiosis of nature and people.



TOYOTA has focused on our BLUE project.

6-3. FCV (Fuel Cell Vehicle)

Moving with Hydrogen

- TOYOTA "MIRAI" released : Dec, 2014
Sales is rapidly increasing.
2015 700 -> 2016 2,000 (sales plan)
 2017 3,000
 2020- over 30,000
- Honda, Mercedes, GM, Mitsubishi, and Subaru will also release FCV in 2016 spring.
- Environmental challenge 2050 (next page)
Toyota makes all new cars zero-emission by 2050.
- Tokyo Olympic / Paralympic 2020
Not only vehicles. FC bus will run in Tokyo with electric bus, and PHEV bus by 2020.



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(Spread to the world)

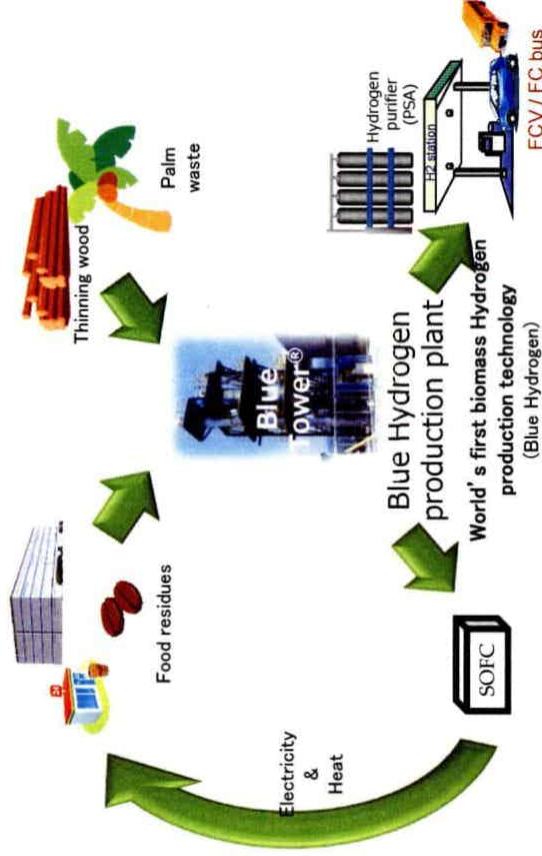


8. BLUE project business model 2 (market strategy for mobile devices)

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Japan Blue Energy Co., Ltd

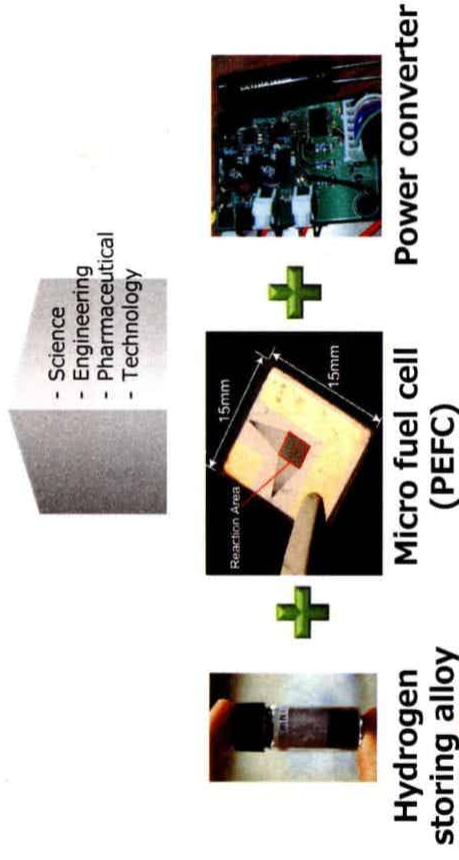
We ourselves procure the biomass raw material and create the hydrogen market, then cause an energy revolution.



* Commercial level
CO₂ free hydrogen



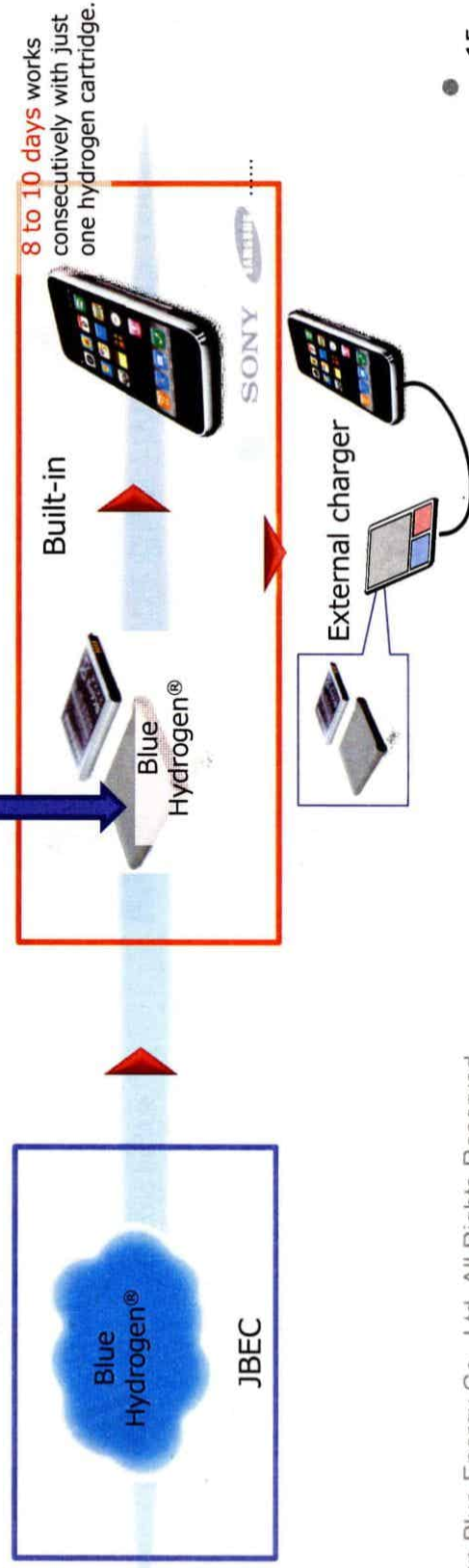
TOKYO UNIVERSITY OF SCIENCE



- Science
- Engineering
- Pharmaceutical
- Technology

It can absorb 12 liters of hydrogen.

※ The market volume will be about \$475 billion per year (test calculated by Intelligent Energy)



User's benefit of Blue Hydrogen



FC mobile devices with Blue Hydrogen®
(Not interposed fossil fuel)

Users can contribute
to the reduction of
CO₂ emissions by just
having it.

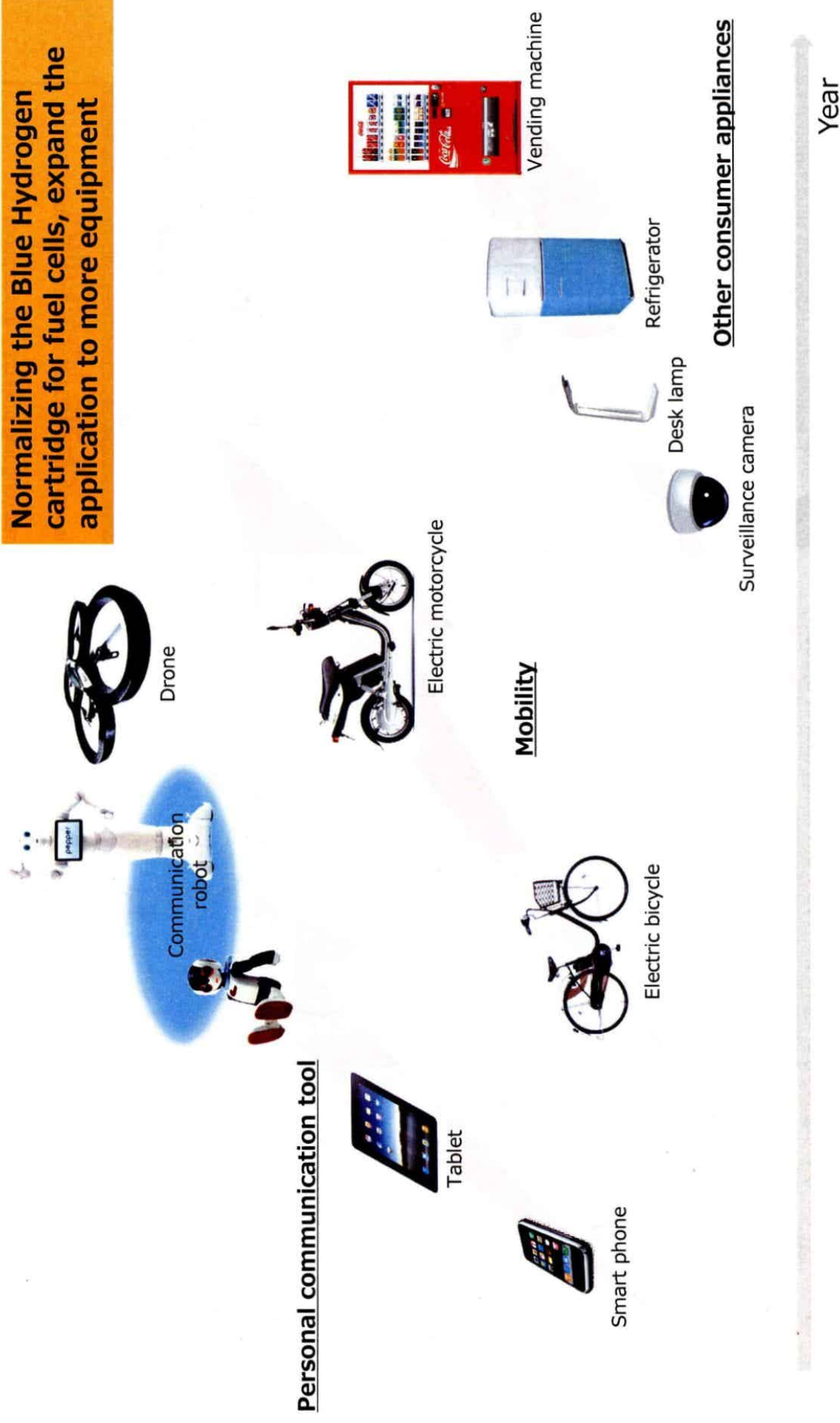
The Blue Hydrogen® consumption can be measured automatically, and also traded immediately on the CO₂ emission trade market in China from 2017.*
-> It is big benefit for users.

- * Need to develop of the system
For example;
 - Blue hydrogen identification
(NFC: Near Field Communication)
 - Data recording
 - Data reading
 - Security, Fraud prevention
 - Application program

Towards the CO₂ emissions trading market (Cap-and-Trade), our strategy is under consideration
(Sensing system technology supply companies, net distribution system companies)

Future Business Development

Normalizing the Blue Hydrogen cartridge for fuel cells, expand the application to more equipment



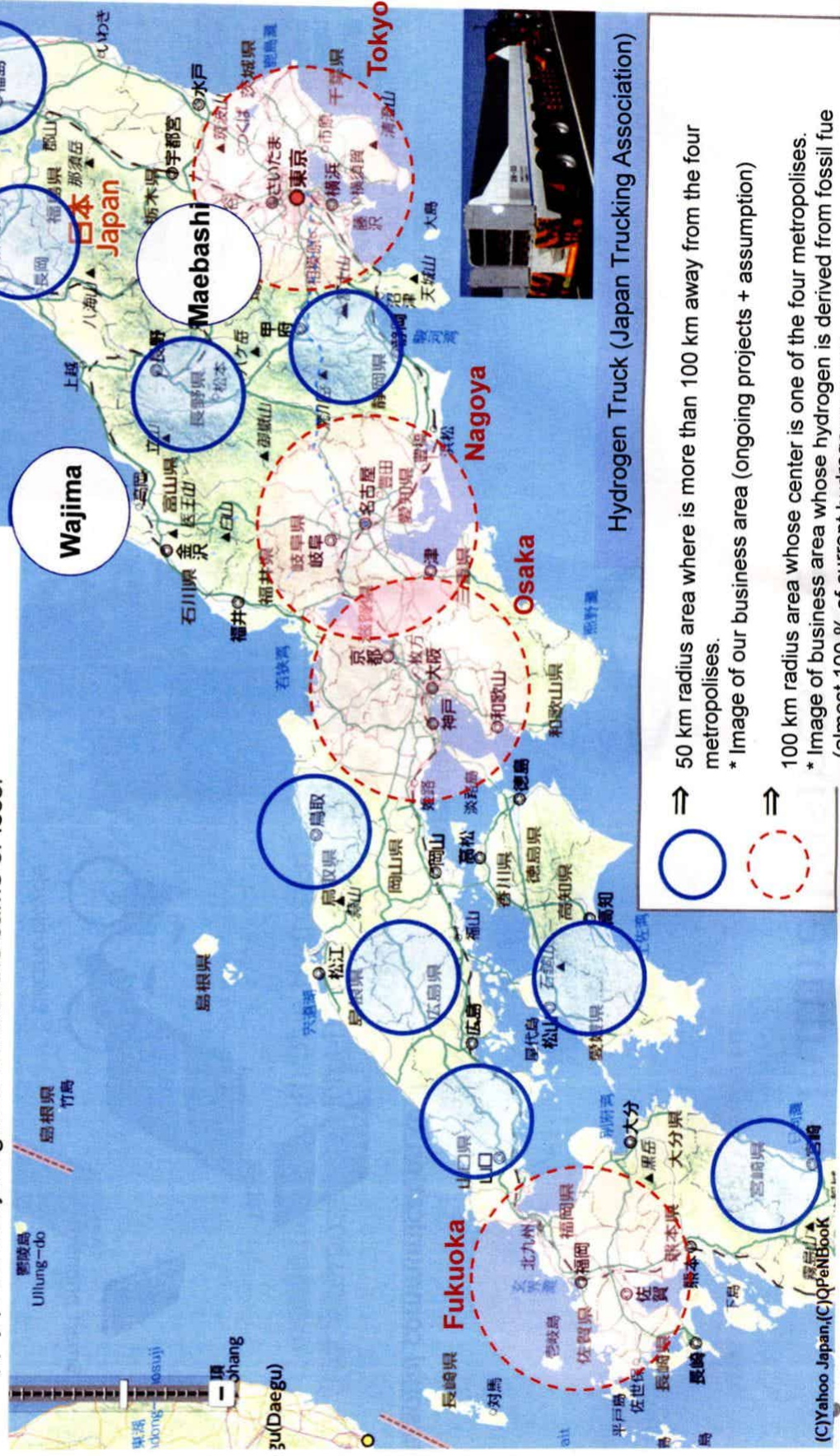
9. Strategy of Hydrogen Business: in Japan

9-1. Feature of BLUE Hydrogen

In case of hydrogen business more than 100 km away from the four metropolises, comparing to hydrogen derived from fossil fuel in those metropolises,

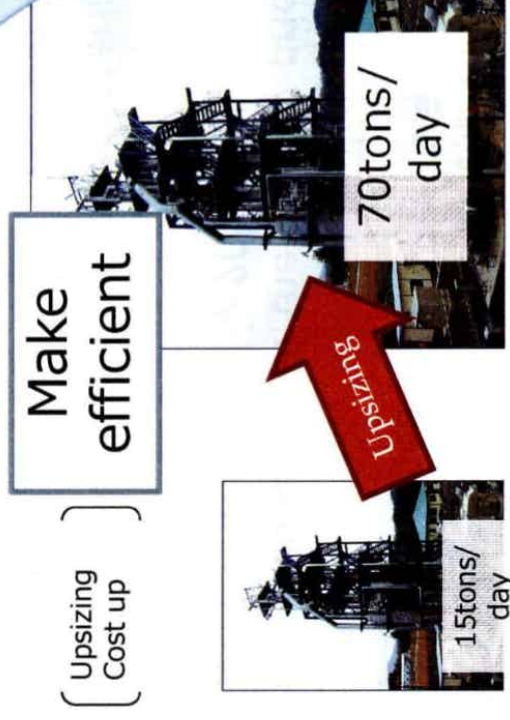
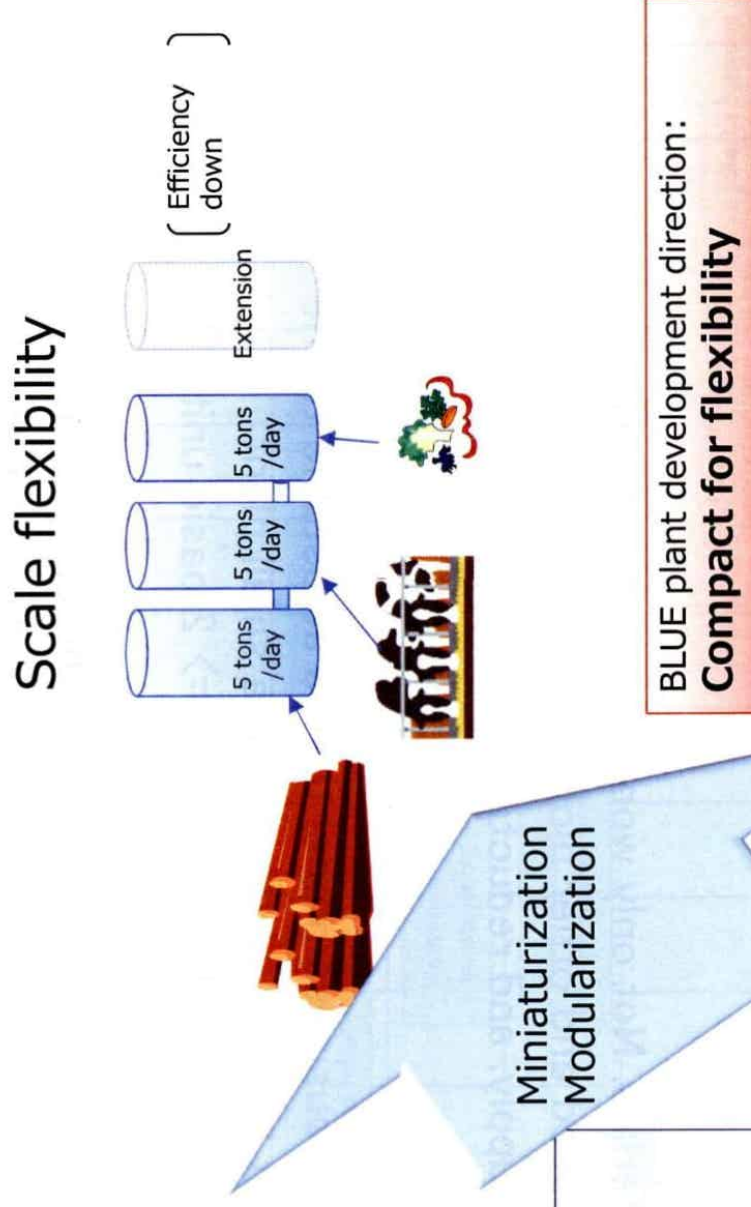
1. CO2 emissions by hydrogen production is 1/5.
2. CO2 emissions by hydrogen transportation is 1/2.
3. Supply price of hydrogen is almost the same or less.

Conduct "local production for local consumption type hydrogen supply business" with local biomass feedstock in where is more than 100 km away from the four metropolises. And then spread it throughout Japan,



9-2. Miniaturization / modularization of plant

- Clients want to...
 - Hold down initial investment
 - Scale up fitting hydrogen market
 - Make waste energy



*these pictures are Izumo pilot plant (1ton/day)



*Tonnage is the raw material processing capacity.

9-3. Summary of BLUE hydrogen production business strategy

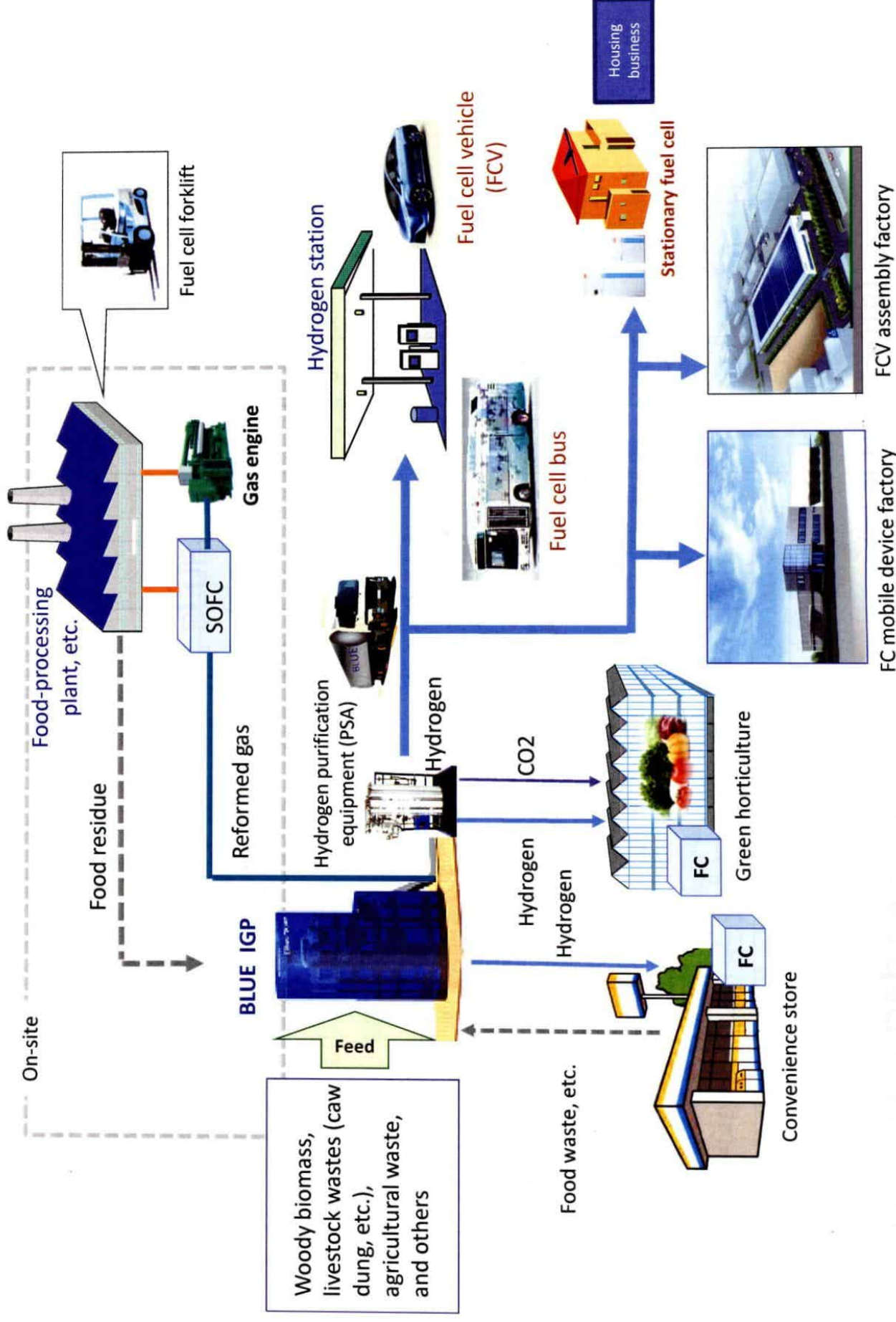
- (1) Business deployment in the area more than 100km away from four metropolises.
- (2) Reduction of the factory price of BLUE hydrogen to 60 yen/Nm³ (99.99% concentration) by 2025
- (3) Diversification of raw materials. Not only woody biomass, but also livestock, agricultural, food-based and other biomass for raw material => Stabilization of raw material supply, and reduction and maintenance of procurement costs.
- (4) Establishment of a diffusive business model that is adjustable to the growth of the hydrogen market by modularization of a small plant
(Basic unit = 5 dry-t/day). (E.g. 10 dry-t/day => 2 basic units)
- (5) Significant reduction of initial construction costs and packaging, automation and etc. of operation process by modularization of a small plant.

10. Business Deployment

(as of March 2016)

		FY2016			FY2017			FY2018			FY2019		
Lot 1	(1) Plant 1: Test & commercial (5dry-t/day in Japan)			Plant construction, building construction, and test run	Start a business								
	(2) Plant 2: Test & commercial (5dry-t/day in Japan)			Plant construction, building construction, and test run	Start a business								
	(3) Plant 3: Test & commercial (10dry-t/day in Japan)			Plant construction, building construction, and test run	Start a business								
Lot 2	(4) Plant 4: Commercial (5dry-t/day in Japan)							Plant construction, building construction, and test run	Start a business				
	(5) Plant 5: Commercial (5dry-t/day in Asia)							Plant construction, building construction, and test run	Start a business				
Lot 3	(6) Plant 6: Commercial (5dry-t/day in Japan)									Plant construction, building construction, and test run	Start a business		
	(7) About 10 plants in Japan and overseas									Plant construction, building construction, and test run			

11. Target of a Local-production & Local-consumption Hydrogen Business



Application to Sewage Sludge Treatment Business

Study Project
- Case 1 -

Established HIT business study group toward practical use (September 10, 2012)

Hydrogen Innovation Town (HIT) 's Participating Companies :

Daiwa Lease Co., Ltd. / Daiwa House Industry Co., Ltd. (Observer) / Japan Blue Energy Co., Ltd.
Mitsui Chemicals, Inc. / Toyota Motor Corporation (Observer) / Toyota Tsusho Corporation

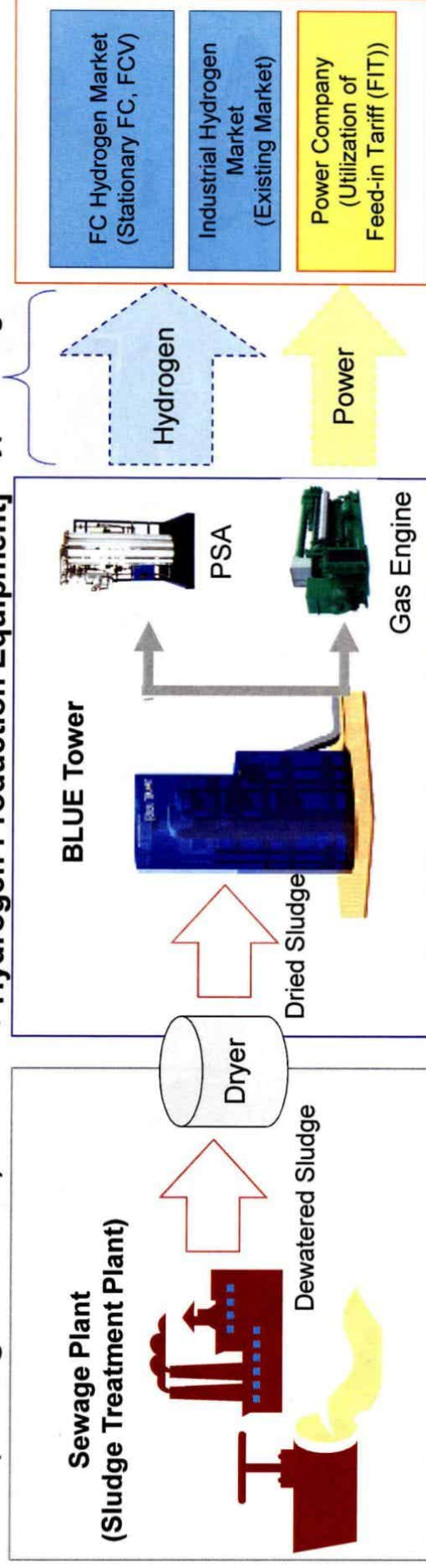
(In alphabetical order)

[Feedstock Supplier]
(Local government)

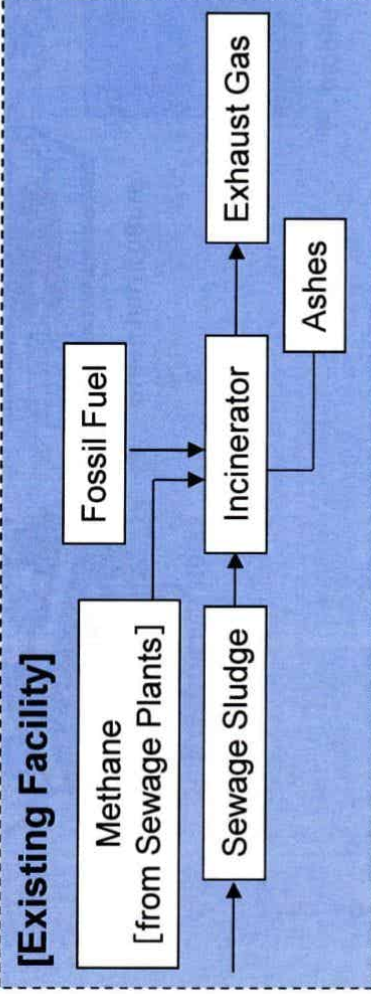
**[Sewage Sludge Treatment Facility
+ Hydrogen Production Equipment]**

Utilization of
byproduct gas

[Energy User]



[Existing Facility]



[Issue of Existing Facility]

It is prime task to reduce N2O emission during sewage sludge burning. N2O is one of GHG whose effect is 310 times of that of CO2.

Overseas Study Project

Study Project
- Case 2 -

Malaysia

JBEC + Government-linked companies + Conglomerates

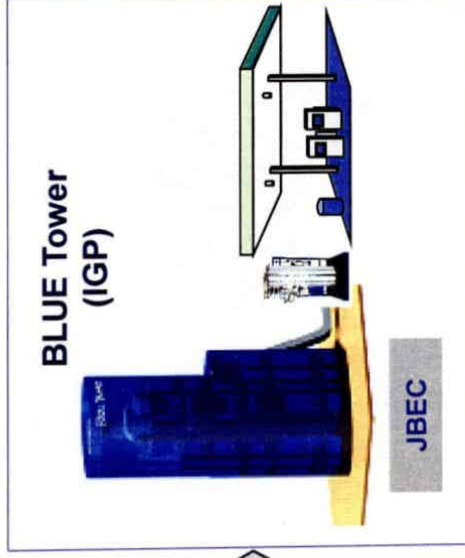
Palm oil mill



Palm resource (EFB)

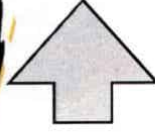


BLUE Tower
(IGP)



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Base of production and filling
of biomass hydrogen



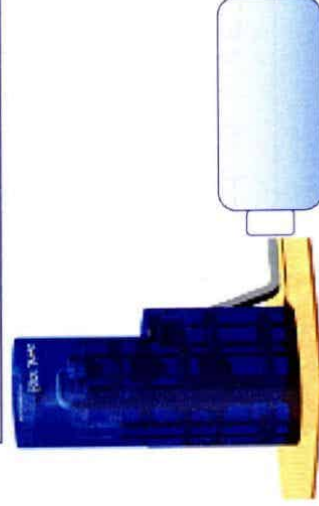
Industrial hydrogen market
in the region



U.S.A.

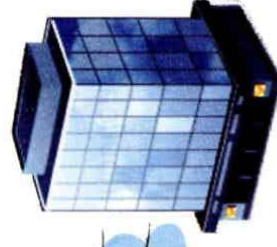
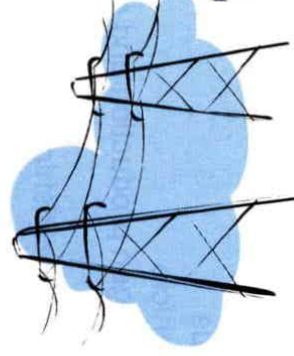
JBEC + State government + University + Company

FC power generation demonstration project



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Commercial SOFC
(Solid oxide fuel cell)



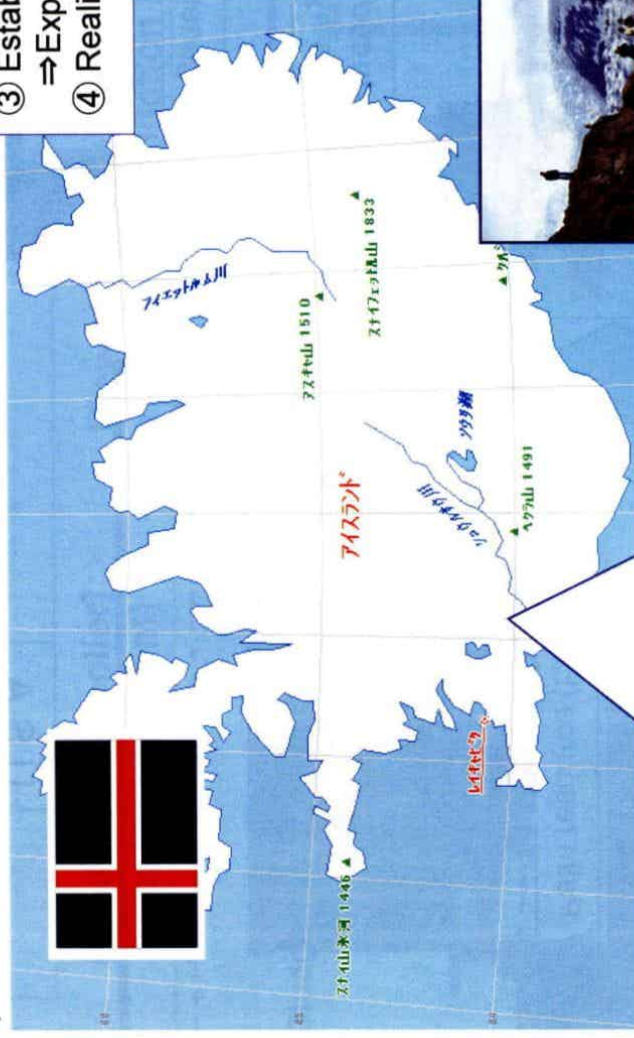
Iceland the first country aimed for a hydrogen energy economy

Reference

Hydrogen Nation Declaration in 1998

"Switch all fossil fuels to hydrogen obtained by water electrolysis by 2050,"

Ecological City Transport System (ECTOS) (March 2001 - Fall 2005)



- ① Introduction of FC bus
- ② Introduction of FC vehicle
- ③ Establishment of hydrogen production and distribution system
⇒ Exports to Europe
- ④ Realization of hydrogen fuel fishing boat

Apr 2003: Opened the world's first commercial hydrogen station at the Shell station in the capital, Reykjavik.

Oct 2003: Demonstration service of fuel cell buses as city bus in the capital, Reykjavik. Served three buses of Daimler Chrysler Corp..



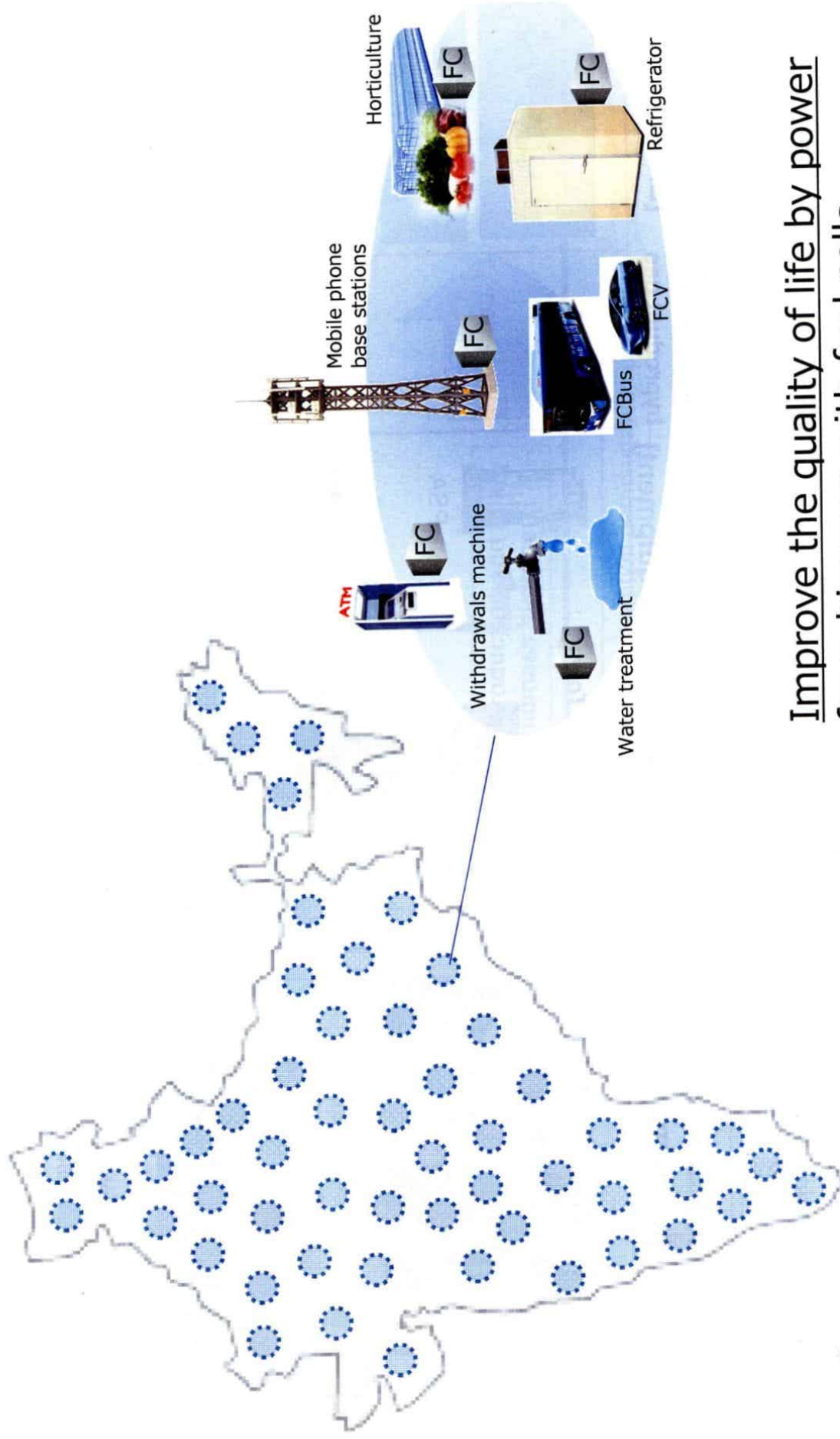
(Demonstration FC Bus in Reykjavik)

- Population: about 300,000
- Area: 103,000 km²
- Rich in geothermal and water resources
Supply most of the energy required for the whole country with hydropower and geothermal
- About 11% of the national land is glacier

<http://www.iceland-kankobunka.jp/gnrl/info/outline/jokull.htm>

12. Business Plan in India

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Plant Location Image

Improve the quality of life by power from biomass with fuel cells.