


Fukuoka Hydrogen Strategy

Fukuoka's Challenge Towards a Hydrogen Society

A photograph of the Fukuoka skyline, featuring several prominent skyscrapers and a large stadium with a distinctive orange dome. The buildings are reflected in the water in the foreground. The sky is clear and blue.

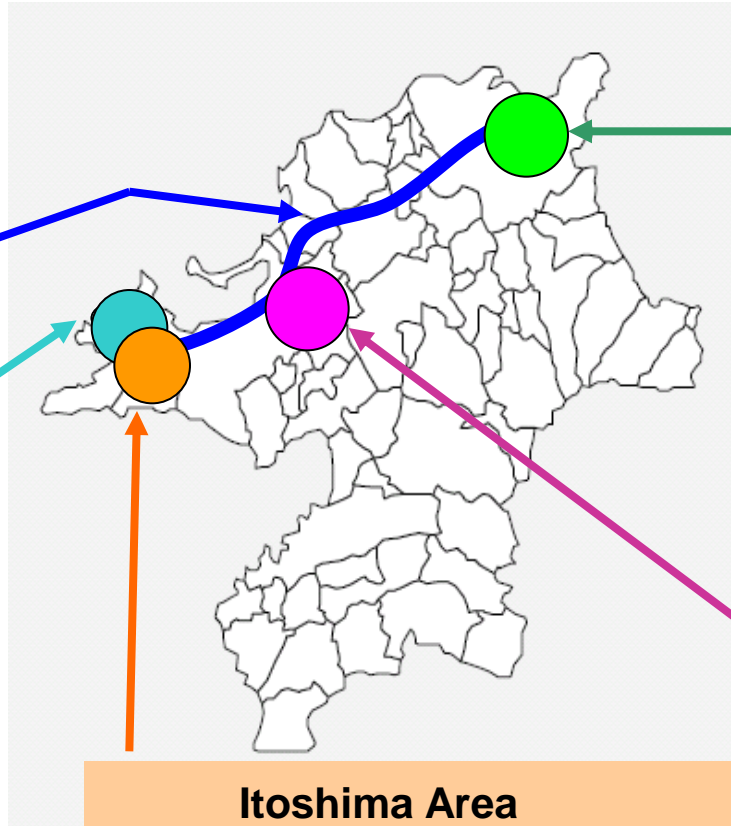
Fukuoka Prefecture Government
Fukuoka Strategy Conference for Hydrogen Energy
Taro Kimura and Hiroyasu Tashiro

Fukuoka Hydrogen Strategy ~Hy-Life Project~

Aiming to achieve a hydrogen energy society and create new industries in Fukuoka.



Hydrogen Highway



Kitakyushu Area



Hydrogen Station



Hydrogen Town

Kyushu Univ. Ito Campus



Hydrogen Station



Hydrogenius



International Research Center for Hydrogen Energy

Itoshima Area



Hydrogen Town

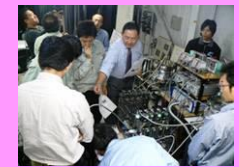


HyTReC

Fukuoka Area



Fukuoka Strategy Conference for Hydrogen Energy



Personnel Training Center

Overview of Fukuoka Prefecture

■ Geographical features

- Fukuoka Pref. lies at the heart of the scenically beautiful island of Kyushu, the southernmost of the four major islands making up Japan.

- Area 4,976km²
- Population 5 million
- GDP \$193 billion

■ Chosen as

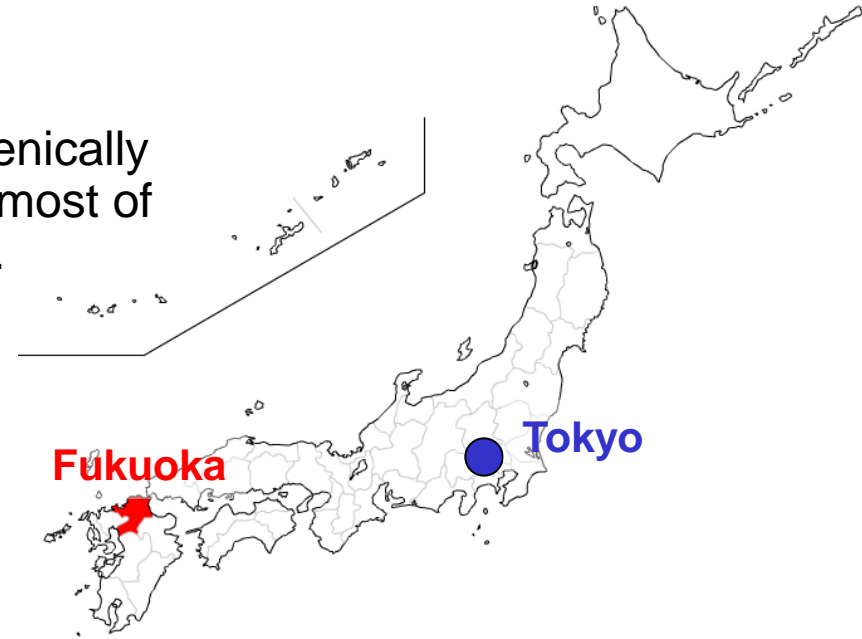
“The World’s Top 25 Most livable Cities”

by Monocle

“The World’s 10 Hottest Cities”

by Newsweek

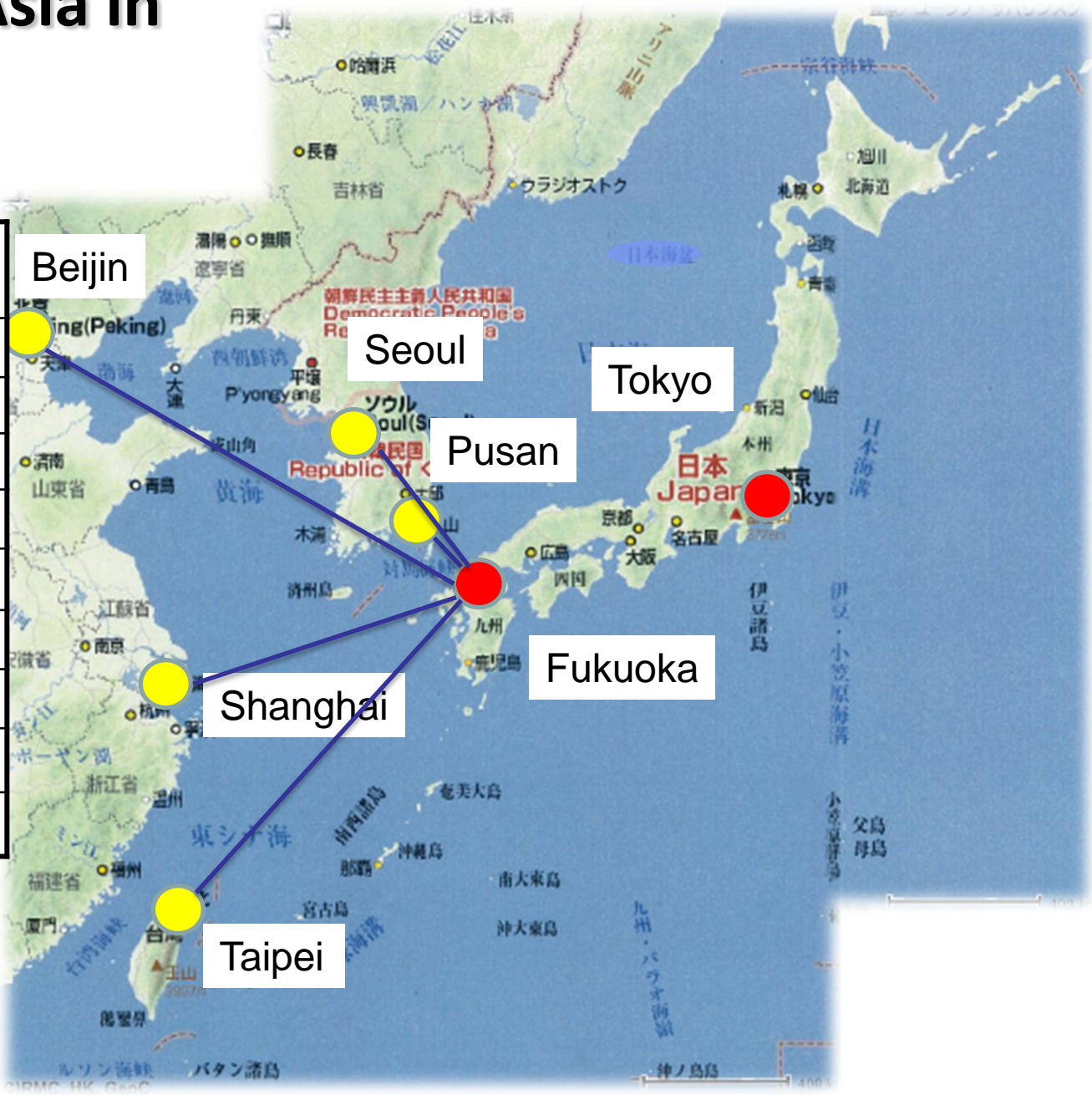
- Harmonious environment of urban life & rich natural beauty
- Friendly people with warm hospitality
- Wide International Community
- Rich traditional culture



Gateway to Asia in Japan

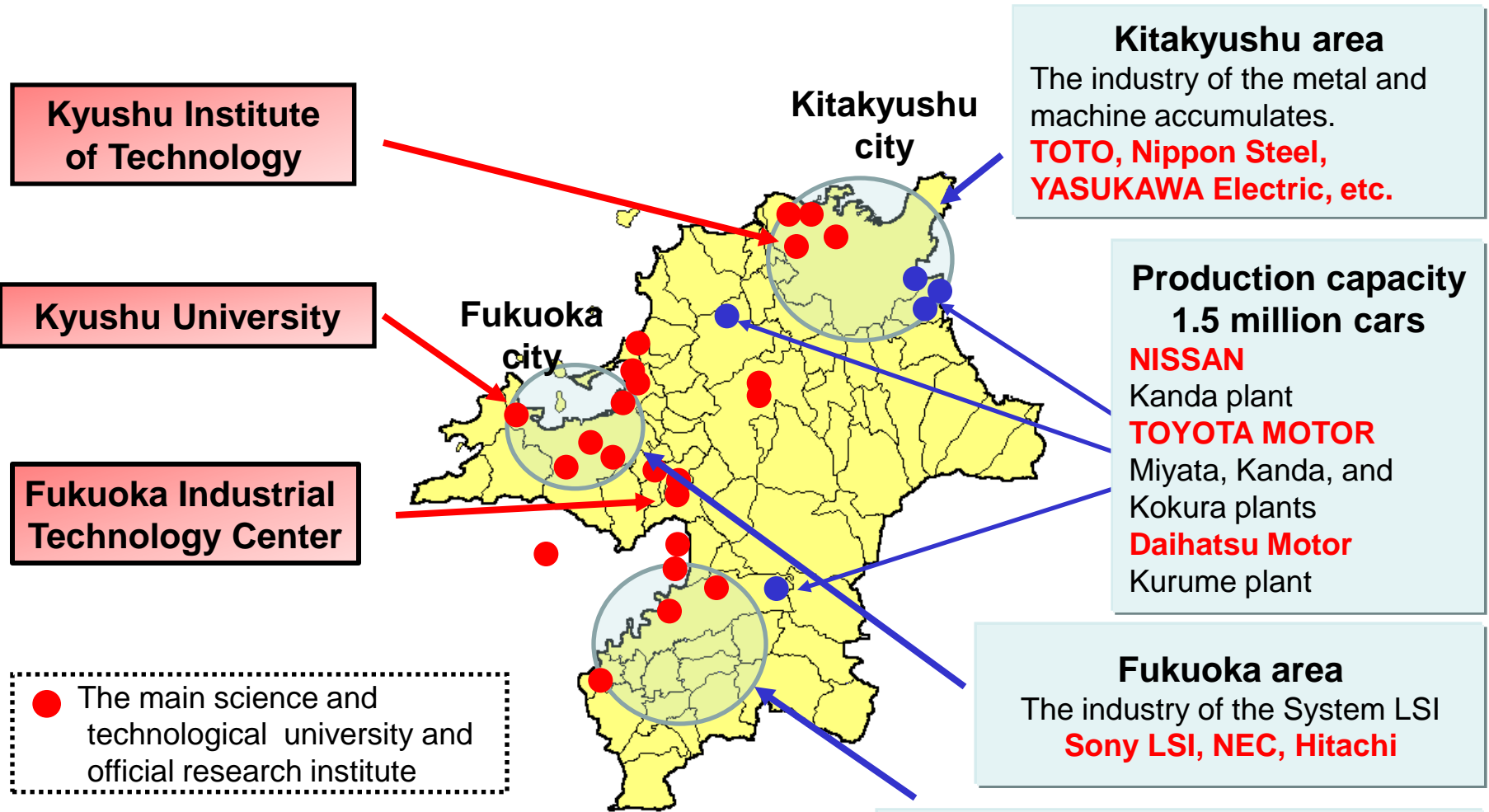
Flights to/from Asian major cities

Destination	Flight time
Pusan	50 min
Seoul	1 hr 15 min
Shanghai	1 hr 30 min
Tokyo	1 hr 30 min
Taipei	2 hrs 10 min
Beijing	4 hrs 05 min
Hong Kong	4 hrs 50 min
Singapore	6 hrs 05 min



To major Asian cities within a few hours

Research and industry in Fukuoka Prefecture



**39 universities including
12 science & engineering universities
and 3 technical junior colleges**

Southern part area
The industry of the chemistry, rubber, and the fiber accumulates.
BRIDGESTONE, Mitsui Chemicals, etc.

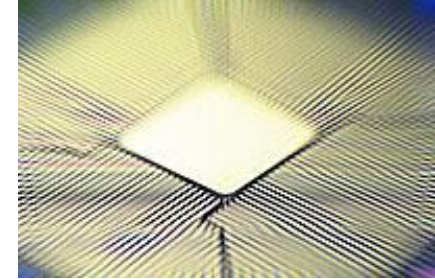
New-growth-industry cluster policy in Fukuoka Prefecture



Hydrogen Energy



Automobile



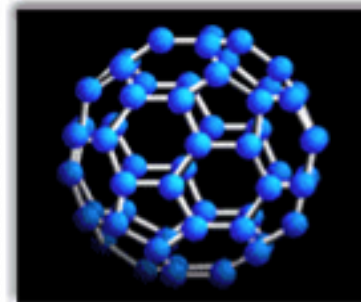
*Semiconductor
& LSI*



Robotics



Biotechnology



Nanotechnology



Digital Contents

Fukuoka Strategy Conference for Hydrogen Energy

A largest industry-academia-government organization in the hydrogen energy field in Japan

members: 607 as of Oct 1, 2010
Corporations: 464
Universities: 109
Government/Sponsoring institutions: 34

Advisors: Wataru Aso (Governor of Fukuoka Prefecture)

Setsuo Arikawa (President of Kyushu University)

Kenji Kitahashi (Mayor of the City of Kitakyushu)

Toru Takimoto (Director General of Kyushu Bureau of Economy, Trade and Industry)

Makoto Haya (Representative Director and President, Nippon Steel Engineering Co., Ltd.)

Hiroshi Yoshida (Mayor of the City of Fukuoka)

President: Keisuke Kuroki (Representative Director and Executive Vice President, Nippon Steel Corporation)

Vice Presidents:

Hisato Ueha (Senior Executive Director and Executive Officer General Manager, Iwatani Corporation)

Ikutoshi Matsumura (Executive Consultant, JX Nippon Oil & Energy Corporation)

Yukitaka Murakami (Special Counselor to the President of Kyushu University)

Hiroyuki Watanabe (Senior Technical Executive, Toyota Motor Corporation)

Overview of H-Life project

HYDROGENIUS
(AIST)



Fukuoka Personnel Training Center for
Hydrogen Energy



Development of a
“Hydrogen Town”



Construction of a
“Hydrogen Highway”



**Research &
development**

**Human resources
development**

**Community
demonstration**

1. Promote measures against
Global warming
2. Promote the widespread
use of new energies
3. Encourage community-based
innovations

**New industries
based on hydrogen**

**International hub for
hydrogen knowledge**



Hydrogen Energy Test & Research
Center (HyTReC)



International Hydrogen Energy
Development Forum

Research & development

Kyushu University : Base of hydrogen research

- Variegated researchers
- Wide research area
- Enhanced research facility
- Great capital resources



Fuel Cells & Hydrogen Utilization

Prof. T. Konomi	Fuel Cell Systems
Prof. H. Mori	Thermal Engineering
Prof. T. Kitagawa	Combustion Engineering
(Prof. K. Sasaki)	Fuel Cell Materials
Prof. S. Nishimura	Polymer Materials
Prof. H. Matsumoto	Solid State Protonics
Prof. M. Koyama	Chemical Engineering
Prof. K. Ito	Thermal Engineering

Simulation

Name	Major
Prof. H. Kanayama	Computational Mechanics
Prof. M. Yamamoto	Robot Engineering
Ass. Prof. N. Okada	Mathematics

Management

Name	Major
Prof. Y. Murakami	Materials Fatigue
Prof. K. Sasaki	Fuel Cell Materials

Hydrogen Safety

Prof. A. Sueoka	Dynamics of Machinery
Prof. A. Furukawa	Fluids Engineering
Prof. S. Takagi	Structural Materials
Prof. Y. Kondo	Strength of Materials
Ass. Prof. M. Inoue	Risk analysis
Prof. H. Noguchi	Strength of Materials
Prof. J. Sugimura	Tribology
Prof. S. Kijimoto	Dynamics of Machinery
Prof. K. Yokomoto	Safety management

Prof. T. Ishihara	Inorganic materials / Fuel Cells
Prof. H. Onikura	Manufacturing
Prof. Y. Ohya	Fluids Engineering
Prof. Y. Takata	Thermal Engineering
Prof. M. Furukawa	Fluids Engineering
Prof. H. Kitagawa	Inorganic Chemistry

Demonstration in Ito campus



Wind power generator



**Stationary PEFC (for restaurant)
~2008**



Hydrogen station



**Stationary PEFC (for bar)
~2009**



Hydrogen research facilities in Ito campus



**AIST-Research Center
(HYDROGENIUS)**



**High-pressure H2
Lab.**

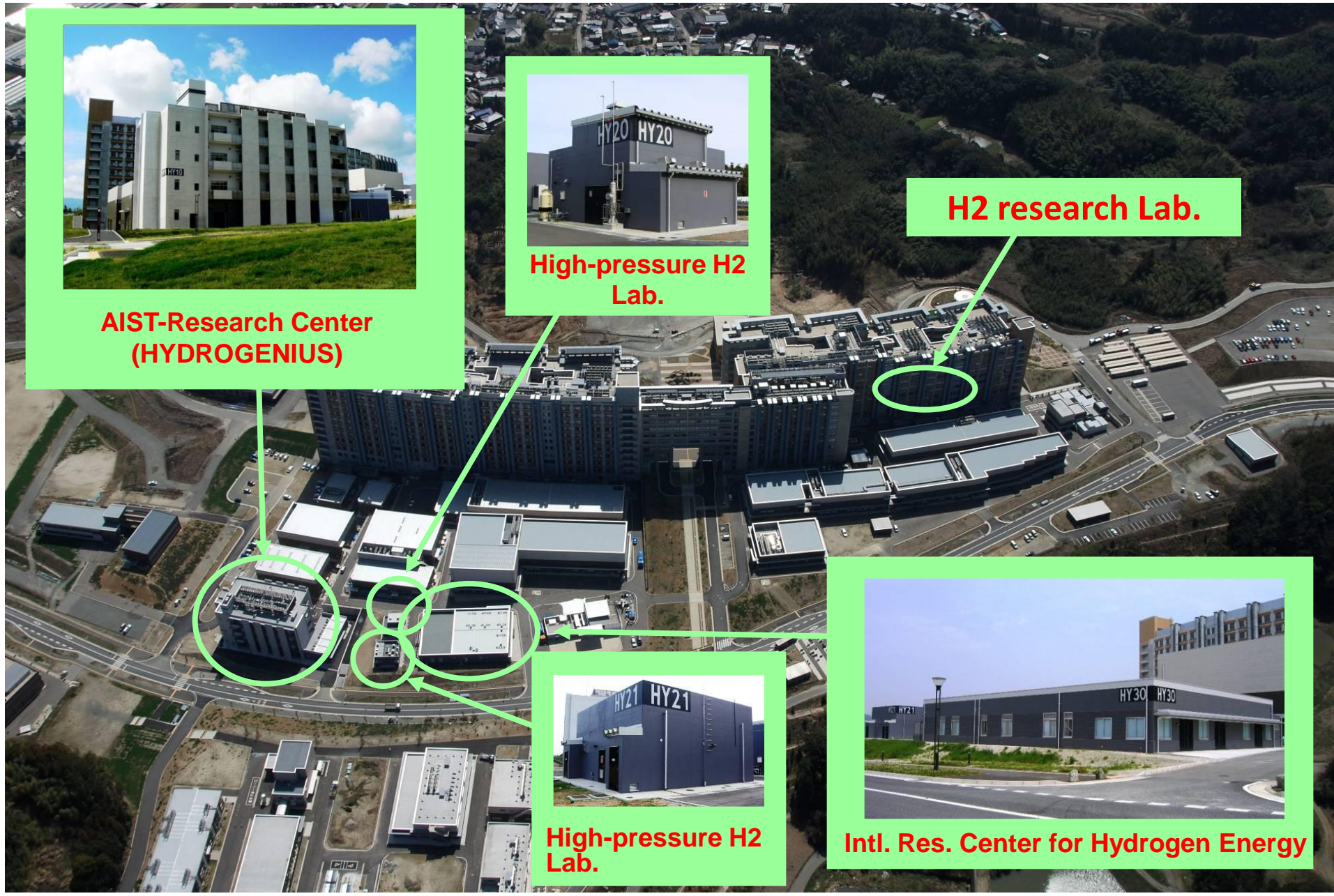
H2 research Lab.



**Intl. Res. Center for Hydrogen Energy
Lab.**

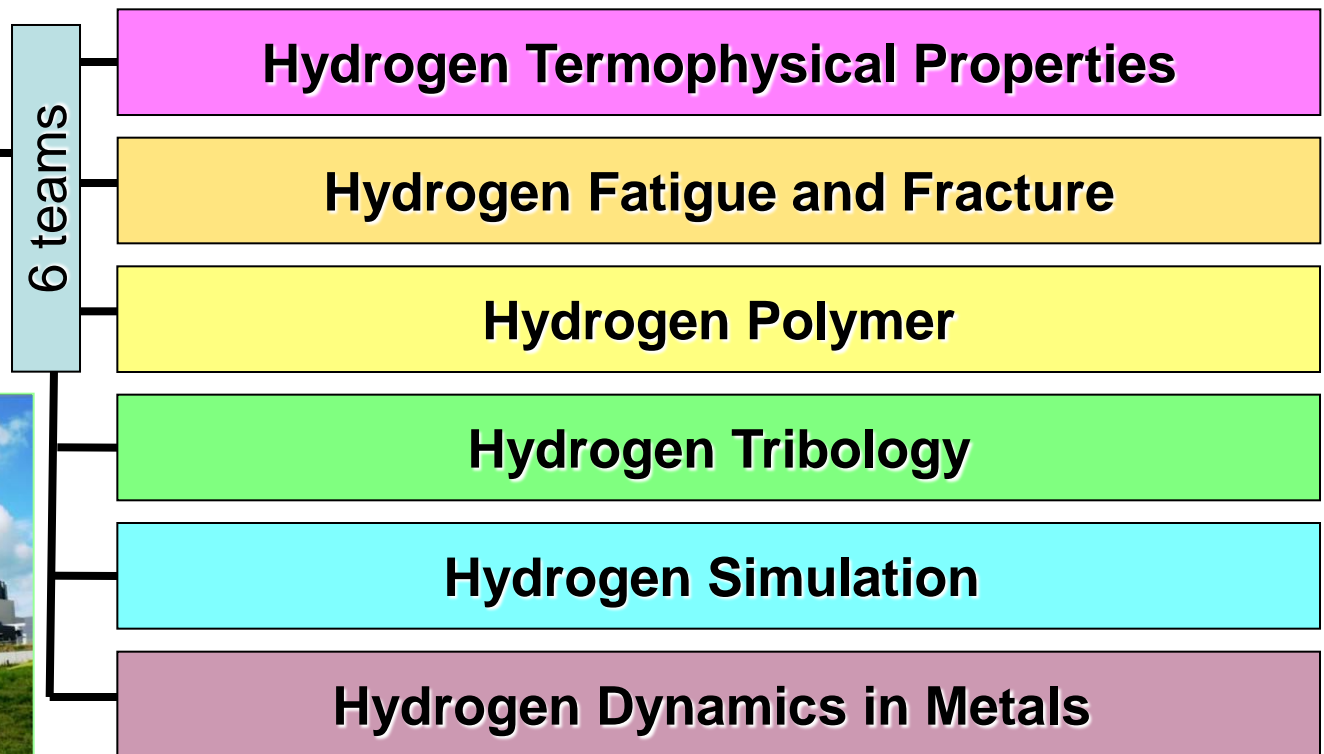


**High-pressure H2
Lab.**



Research Center for **Hydrogen Industrial Use and Storage (HYDROGENIUS)**

National Institute AIST established HYDROGENIUS on Kyushu Univ. Ito Campus in July 2006.



A world-class research institutions

“HYDROGENIUS”



M.Sc. Jussi Solin
VTT Technical Research
Centre of Finland
FINLAND



Prof. Gary Marquis
Helsinki University
of Technology
FINLAND



Prof. Reiner Kirchheim
Institut für Materialphysik
GERMANY



Dr. Sergiy M. Stepanyuk
Paton Electric Welding
Institute of National
Academy of Sciences
UKRAINE



Dr. Vladyslav Shyvaniuk
Institute for Metal Physics
UKRAINE



Dr. Maxim Artamonov
State Centre for Civil Aviation Flight Safety
RUSSIA



Prof. Roderick A. Smith
Imperial College,
UK



Prof. R.O. Ritchie
University of California
USA



Dr. Brian P. Somerday
Sandia National Laboratories
USA



Dr. Isabelle Aubert
LMP-University of Bordeaux1
FRANCE



Dr. Nicolas Saintier
LAMEFIP-ENSAM
FRANCE



Prof. Jader Furtado
Air Liquide Groupe Expert
R&D:Metallurgie Physique
FRANCE
(Professor, Kyushu University)



Prof. Dan Eliezer
Ben-Gurion University
of the Negev
ISRAEL



Prof. Petros Sofronis
University of Illinois
USA



Prof. Ian M. Robertson
University of Illinois,
USA



Prof. Jean-Marc Olive
University of Bordeaux I
FRANCE

(Professor, Kyushu University)



National projects to form worldwide base of hydrogen energy at Kyushu University

2003-2007 (0.7 billion Yen / 5 year)

The 21st Century COE Program :MEXT
“Integration Technology of Mechanical Systems for Hydrogen Utilization”

2006-2012 (10 billion Yen / 7 year)

Fundamental Research Project on Advanced Hydrogen Science
: METI / NEDO
“Basic Science for the Development and Use of Hydrogen Energy System”

20010-2019 (14 billion Yen / 10 year)

World Premier International Research Center (WPI) Initiative: MEXT
“Carbon-Neutral Energy Research Institute”

MEXT:Ministry of Education, Culture, Sports, Science and Technology
METI:Ministry of Economy, Trade and Industry
NEDO:New Energy and Industrial Technology Development Organization

ENE · FARM : Residential Fuel Cell System

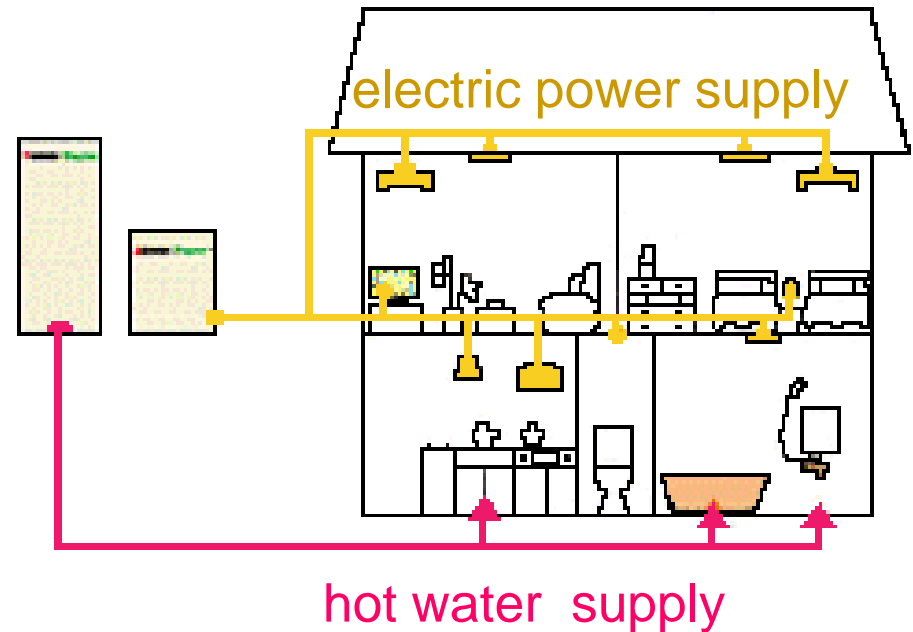
ENE · FARM is a residential fuel cell system commercialized at 2009. Because it produces not only electricity but also the hot water by using the waste energy, a high energy efficiency can be obtained.



(unified logo for Residential Fuel Cells)



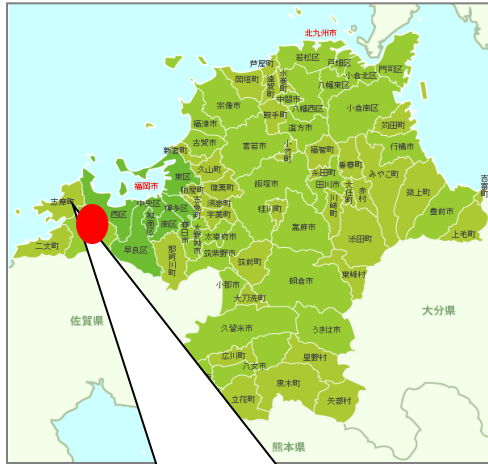
LPG-based 1 kW
Residential Fuel Cell System



Electricity	max 35 %	} Generation efficiency 85 %!!
Heat recovery	max 50 %	

Community demonstration

Fukuoka Hydrogen Town



Minakazedai and Misakigaoka
(Itoshima City)

ENE·FARM has been installed at 150 houses in a community.

This is the world's largest demonstration project of this kind.



The Sunday Times July. 4. 2010



ENERGY AND ENVIRONMENT
JAPAN LEARNS TO LIVE WITH HYDROGEN P9

04.07.10 | THE SUNDAY TIMES
thesundaytimes.co.uk/business | Section 3



Green living
The Japanese city of Fukuoka is pioneering hydrogen as a clean energy source



Hydrogen fuel cells generate electricity that can provide enough energy to meet about 60% of a home's requirements

Heat created as a by-product from the fuel cell is funnelled to a water boiler and central heating system

The generators reduce household energy consumption and CO2 emissions by **30%**

Welcome to Hydrogen City

After hybrid cars, the Japanese are now testing hybrid homes.
John Arledge in Fukuoka reports on a green experiment

For a 70-year-old man, having a Toyota Prius in the driveway is not unusual. His house, as well as his car, is a hybrid. "I'm living the hybrid life," he said.

The 67-year-old man shares with his wife, Mitsuko, near Fukuoka, a city 600 miles west of Tokyo, has mains electricity but chiefly runs an electric and heat generated from hydrogen, which is cheaper

lacked by central government, believe that hydrogen is the fuel of the future and are creating the world's first hydrogen-powered town and building the first "hydrogen corridor" between Fukuoka and Osaka and Tokyo.

The idea is simple. Supply homes with hydrogen to generate electricity to power lights and heat water. At the same time, create a network of

stations will be built by 2030 — enough to fuel an cars a year. Analysts say that the number of hydrogen fuel-cell cars in Japan could reach 100,000 by 2020.

Her homes, Nippon Oil and Sojitz Gas Energy are building and installing mini hydrogen generators, known as fuel cell stacks. These convert natural gas into hydrogen through a chemical reaction between the gas and water.

Soon, the manufacturers hope to do away with the need for natural gas altogether and convert water straight into hydrogen. The hydrogen generated is used to create electricity by the reaction between hydrogen and oxygen, and the fuel cell also produces enough power to generate 60% of the mains

look like a modern air conditioning unit, share many of the characteristics of hybrid cars. They constantly monitor energy consumption and "renew" fuel use.

And, this being Japan, the generators not only analyse and display a home's energy usage, but also talk to householders. A woman with a child-like voice praises every effort at energy saving.

Living in a hybrid home has costs. Just like driving a hybrid car, the fuel bills have gone down 10% — not as much as the fuel saved by driving a hybrid car. But Nippon Oil said this figure will rise as the hydrogen technology improves. Some day, it hopes, it will be possible to have a zero-emissions life at home and on the road.

After hybrid cars, the Japanese are now testing hybrid homes.

- • • reduce house hold energy consumption and carbon-dioxide emissions by 30%.

- • fuel bills have gone down 10%.

Community demonstration Fukuoka Hydrogen Highway

“Hydrogen Highway” between Kitakyushu and Fukuoka by constructing two hydrogen stations.



Kyushu University Hydrogen Station



Kitakyushu Hydrogen Station

The FCV can run freely this area.

Hydrogen Stations in Fukuoka

Kyushu University Station

On-site type station which produces H₂ from renewable energy

Construction site: Fukuoka City
(Kyushu University Ito Campus)
Filling Pressure: 35 MPa



Kitakyushu Station

Off-site type station that is provided with H₂ direct through pipeline from Steel Work

The third example in the world!

Construction site: Kitakyushu city
Filling Pressure: 35 MPa



Fuel cell vehicles in Fukuoka

Toyota FCHV-adv



(Fukuoka Prefecture, 2009~)



(Kitakyushu City Hall, April 21, 2009 ~)

Honda FCX C1 arity



(Fukuoka Prefecture, 2010~)

Mazda Premacy Hydrogen RE Hybrid



(Yaskawa Electric Co., ~2009)



(Iwatani international Co., 2009~)

Human resources development

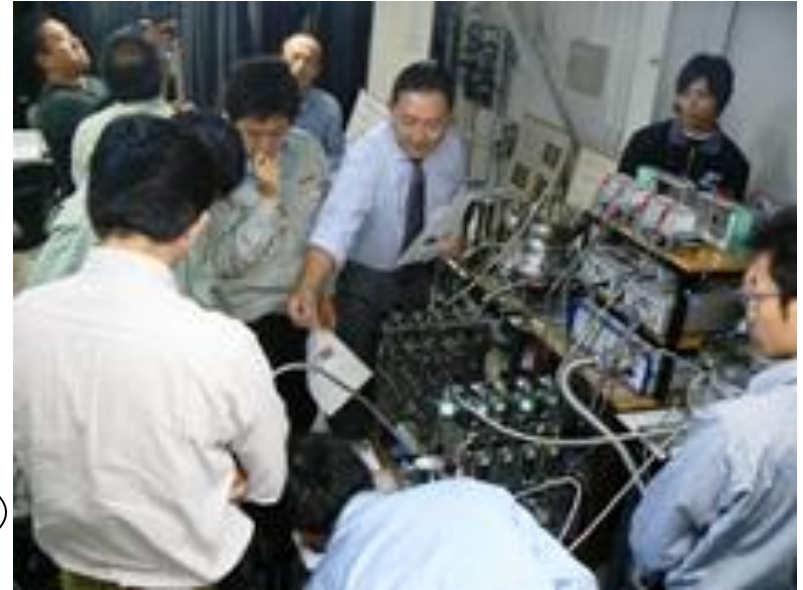
Fukuoka Personnel Training Center for Hydrogen Energy

Business managers program

Engineers program

Expert technologists program

Total 624 people!!



Director: Hiroyuki Watanabe, Senior Technical Executive, Toyota Motor Co.

Instructors: Kyushu Univ., AIST, NEDO, Japan Automobile Research Institute, Iwatani International Co., ENEOS CELL TECH, Taiyo Nippon Sanso Co., Matsushita Electric Industrial Co., Toshiba Fuel Cell Power Systems Co., Nippon Oil Co., Toyota Motor Co, TOTO Ltd., ...

Building an international hub of hydrogen knowledge

International Hydrogen Energy Development Forum 2010

- The only event in the world where experts on hydrogen materials meet to present the latest research on hydrogen energy.
- Hosted annually since 2007.

February 3, 2010 (venue: Grand Hyatt Fukuoka)

Free admission, Japanese-English simultaneous interpretation available

Session 1 Global Hydrogen Strategy for the Realization of a Hydrogen Energy Society



Mr. Wataru Aso
(Governor of
Fukuoka
Prefecture)



Mr. John W. Tak
(President and CEO of the
Canadian Hydrogen and Fuel
Cell Association (CHFCA))



Dr. Andreas Ziolek
(Fuel Cell and Hydrogen
Network North Rhine-
Westphalia)

Session 2 The Front-Lines of Hydrogen Studies — Hydrogen Technology from Basic Research to Engineering Activities

University of California
University of Illinois
Sandia National Lab
Air Liquide CRCD

Prof. Robert. O. Ritchie
Prof. Petros Sofronis
Dr. Brian. P. Somerday
Dr. Jader Furtado

(USA)
(USA)
(USA)
(France)

etc

450 people from 23 countries.

International Hydrogen Energy Development Forum 2011



February 2~3, 2011
(venue: Grand Hyatt Fukuoka)

Free admission, Japanese-English
simultaneous interpretation available

Please see here for details!!

[http://www.congre.co.jp/hydrogen2011/
english/](http://www.congre.co.jp/hydrogen2011/english/)

Session 1 "Moving Towards a 2015 Target for Commercialization of FCVs "

Mr. Akihiro Iiyama (NISSAN MOTOR Co., LTD.)

Mr. George P Hansen (General Motors)

Dr. Andreas Opfermann (Linde Gas and Engineering)

Session 2 "Global Strategies for Realization of a Hydrogen Energy Society"

Prof. Petros Sofronis (University of Illinois, Kyushu University)

Dr. Antonio Ruiz (U.S. Department of Energy, DOE)

Speaker of Norway

Speaker of Finland

Dr. Brian P. Somerday (Sandia National Lab)

Mr. Shogo Watanabe (Hydrogen Energy Test and Research Center)

Prof. Saburo Matsuoka (HYDROGENIUS)

Building an international hub of hydrogen knowledge

Hydrogen Energy Advanced Technology Exhibition 2009



October 21-23, 2009
(Kitakyushu City)

33,260 people



FC EXPO seminar in Fukuoka



Technical seminar



FC assist bicycle trial-ride fair

Spread and enlightenment



Education



Hydrogen Energy Test & Research Center (HyTReC)

To assist SMEs and ventures to enter into new hydrogen industries.

Services



○ Product testing for prototypes, etc.

- Product testing at the center facilities (common facilities)
- Product testing using limited-access facilities

○ Development of product-testing methods

- Development of product-testing methods on public commissions (e.g., standardization of testing methods (JIS))
- Development of product-testing methods on private contracts

○ Development of hydrogen products

- Product development through joint research with private sector (e.g., valves, new materials)



IPHE Excellence in Leadership Award

(2010. May. 17 in Germany Essen)

INTERNATIONAL PARTNERSHIP
FOR HYDROGEN AND FUEL CELLS
IN THE ECONOMY
2010 AWARDS PROGRAM

IPHE EXCELLENCE IN LEADERSHIP AWARD

PRESENTED TO

*Fukuoka Strategy Conference
for Hydrogen Energy Hy-Life Project*



International Partnership
for Hydrogen and Fuel Cells
in the Economy

In recognition of its
leadership in forging
partnerships to integrate
hydrogen and fuel cell
technologies into society.

**Fukuoka Strategy Conference for Hydrogen
Energy as the winner of the award**



IPHE : The International Partnership for Hydrogen and Fuel Cells in the Economy

Fukuoka's Challenge Towards a Hydrogen Society

Goal: Develop an “Advanced Hydrogen Energy Community” committed to R&D, demonstrations, human resources development, and dissemination of knowledge in the hydrogen field.

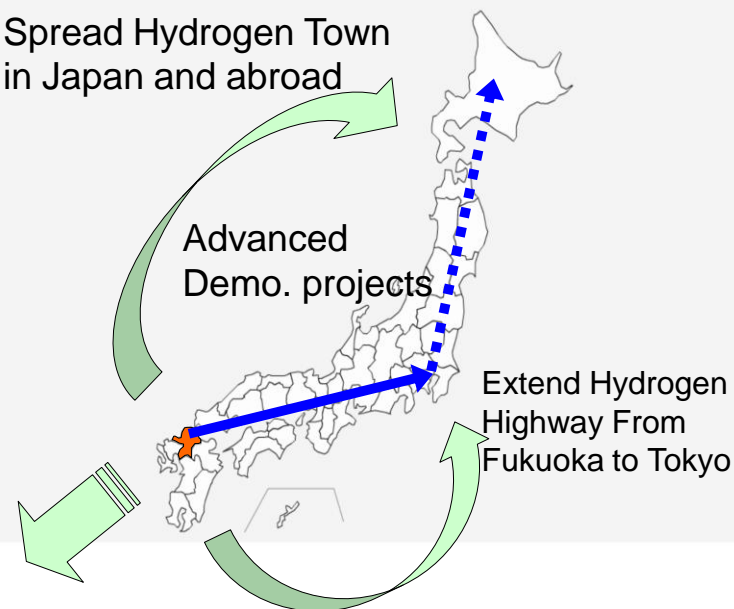


Help create a low-carbon society by establishing the first hydrogen community and spreading its know-how in Japan and abroad.

Fukuoka's initiatives towards Advanced Hydrogen Energy Community

- **Introduce new initiatives for Hydrogen Town:**
Support the development of residential FC for the global market.
- **Promote construction of hydrogen stations:**
Construct a hydrogen highway between Fukuoka and Tokyo to develop and popularize hydrogen/hydrogen-engine vehicles.
- **Implement advanced demonstration programs:**
Lead a review of regulatory framework based on new knowledge.

Spread Hydrogen Town
in Japan and abroad





Thank You



Fukuoka Strategy Conference for Hydrogen Energy

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