

The 11th NEDO-CDTI Joint Workshop  
“Technologies for Hydrogen Valley in Spain and Japan – Regional H2 Value Chain”

Hydrogen



水素が  
次世代エネルギー  
社会を切り拓く!

Starting GX(Green Transformation!!)  
Starting a hydrogen energy society in Yamanashi Prefecture

January 24<sup>th</sup>, 2023

Masaki Sakamoto

Yamanashi Pref. Public Government Enterprise Bureau  
Yamanashi Hydrogen Company, Inc.





- About Yamanashi Prefecture
- Power to Gas System Technology Development(FY2016-21)
- Yamanashi Hydrogen Company(From FY2021)

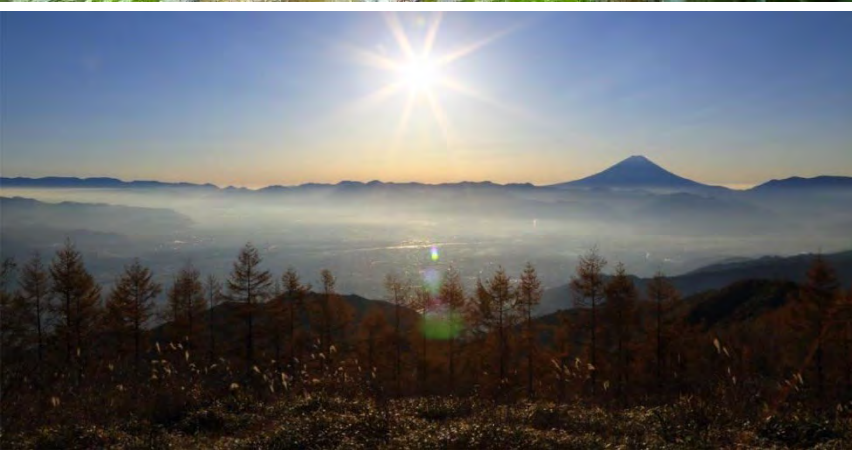


山梨県企業局

Yamanashi Pref. Public Enterprise Bureau



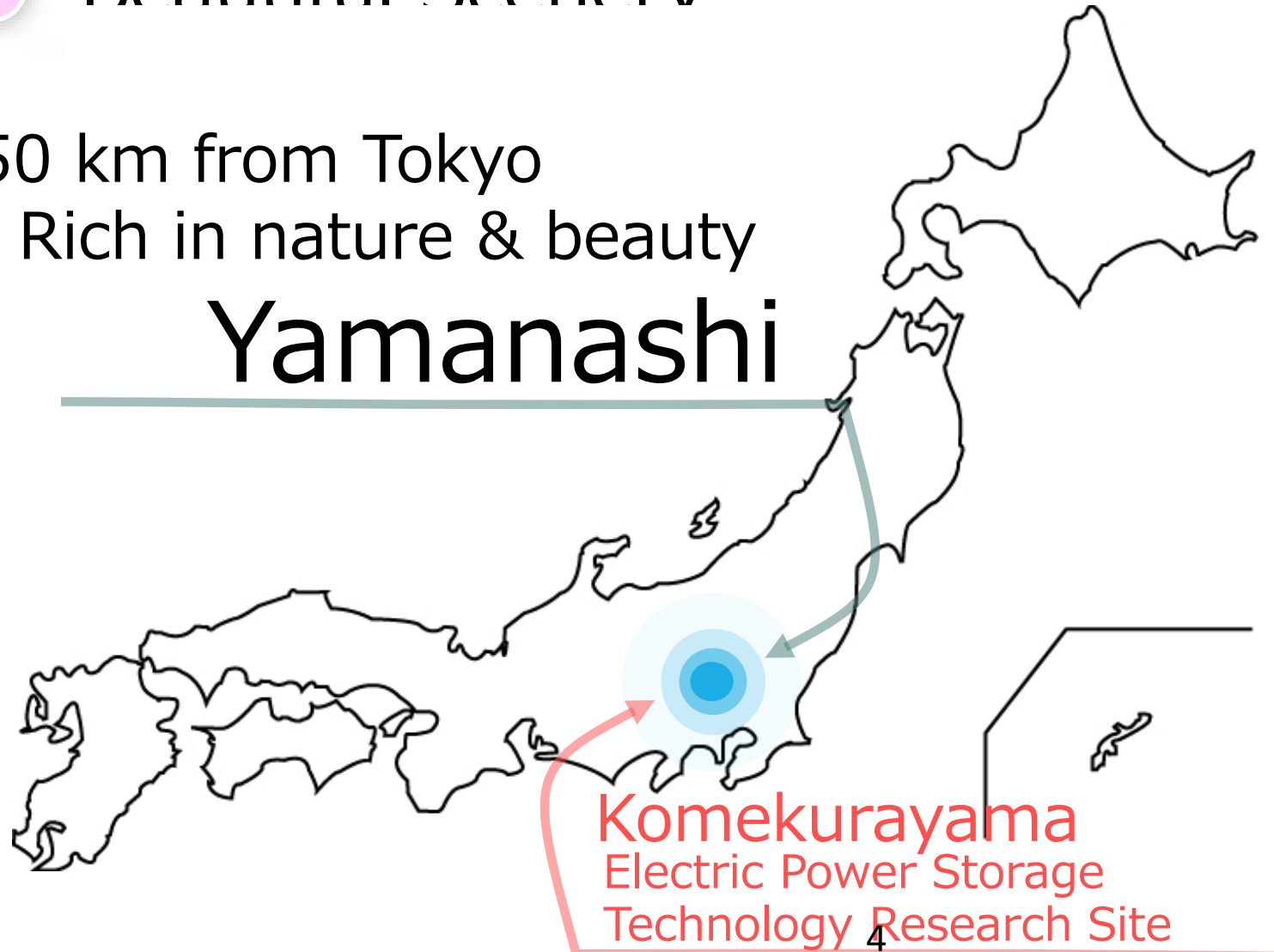
## About Yamanashi Prefecture



● Beautiful Scenery

150 km from Tokyo  
Rich in nature & beauty

# Yamanashi



Komekurayama  
Electric Power Storage  
Technology Research Site



# Steps

2022 Open **"Next-Generation Energy System R&D Village"**  
FC-CUBIC, Next-Generation Energy System Projects



2016 **P2G System Technology Development**  
Jun 2021 2.3MWPEM type P2G system demonstration test started



2014 Opened **"Electric Power Storage Technology Research Site"**  
Superconducting Flywheel Energy Storage Systems,  
Hybrid Hydrogen-Battery Systems, Hydrogen Technical Center, etc.

2011 **"Komekurayama Solar Power Plant"** and  
**"Yume Solar Hall Yamanashi"**  
Expanding renewable energy and starting R&D on  
Electric Power Storage Technology for effective use

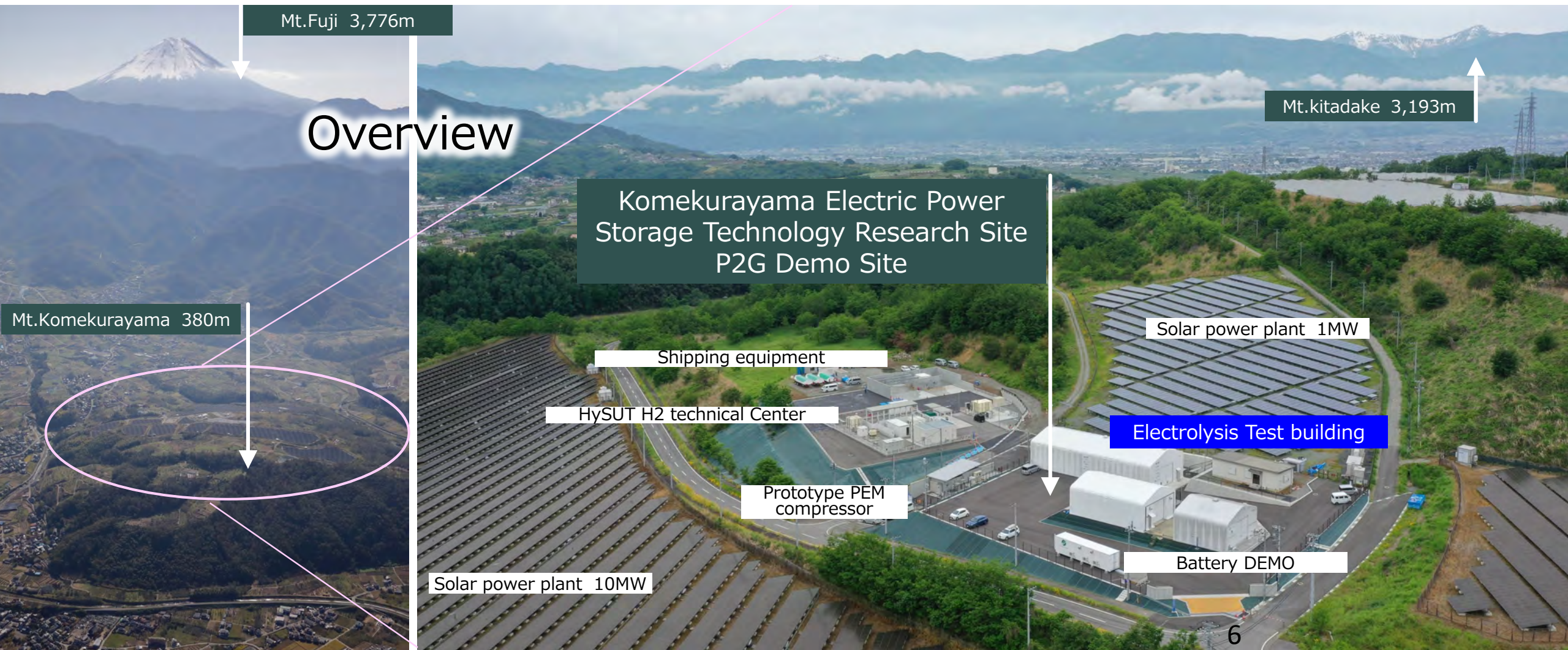


1957~ **Electric Power Industry**  
27 Hydroelectric Power Plants opened in Yamanashi  
Total Output: 121 MW (500 million kWh)



# Development and Demonstration of P2G System Technology

## Aiming to Build a CO2-Free Hydrogen Society



Overview

Mt.Fuji 3,776m

Mt.kitadake 3,193m

Komekurayama Electric Power Storage Technology Research Site  
P2G Demo Site

Solar power plant 1MW

Shipping equipment

HySUT H2 technical Center

Electrolysis Test building

Prototype PEM compressor

Battery DEMO

Solar power plant 10MW

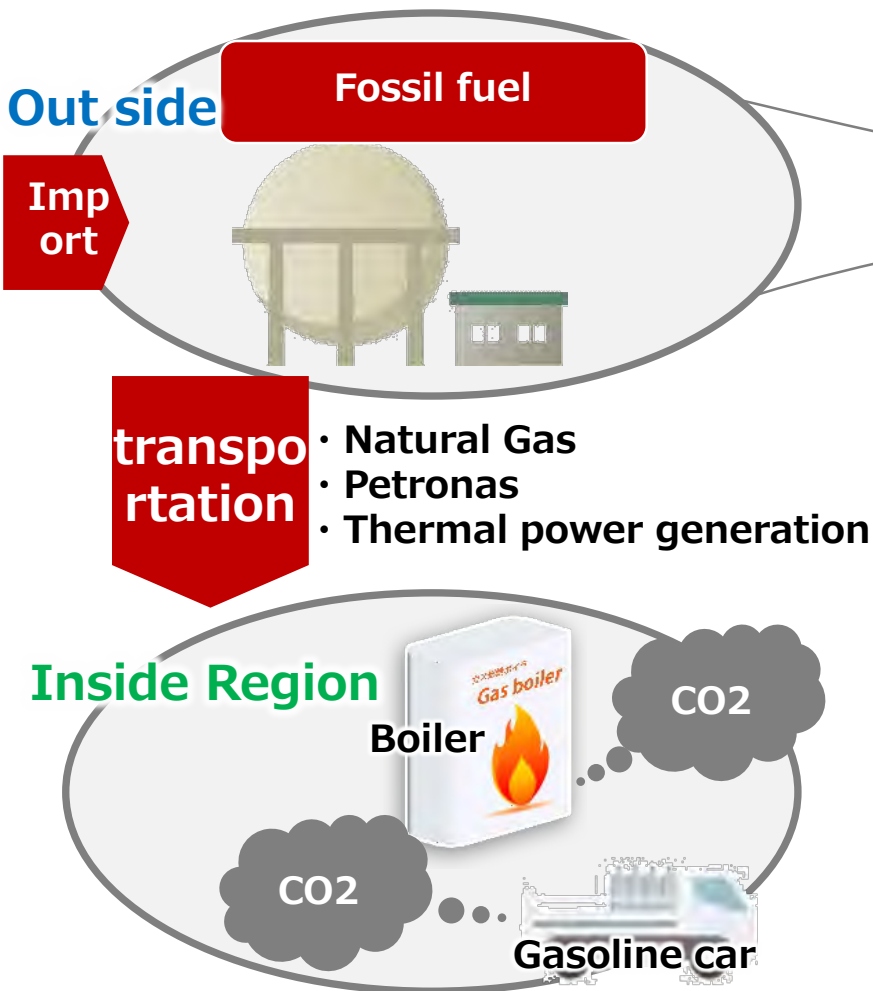
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Considered from the perspective of the local area.

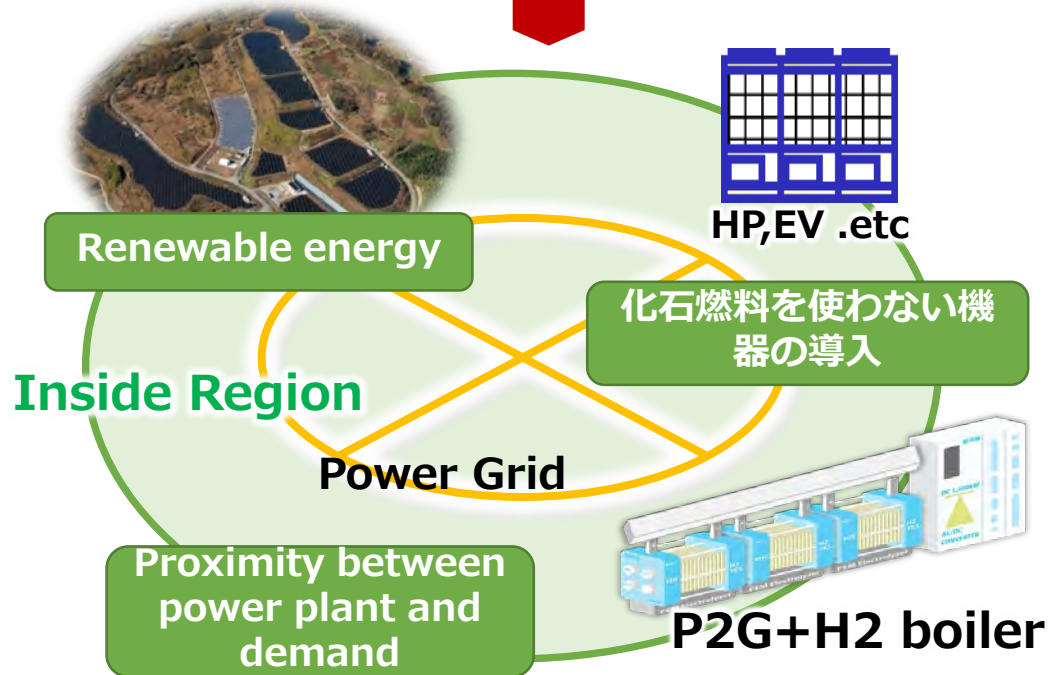
Shifting to a supply and demand structure that covers regional energy with renewable energy and regional revitalization

So far : Fossil fuel model

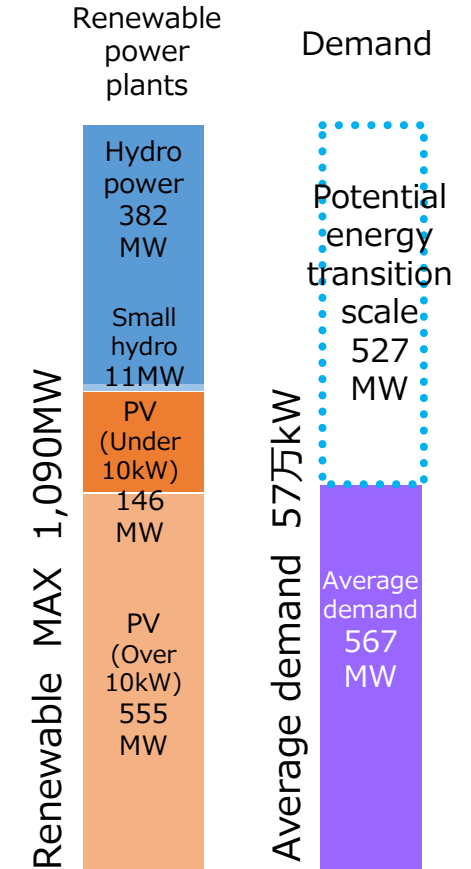
from now : Regional CO2 free model



Minimize dependence from outside the area



**In Yamanashi Electric supply and DEMAND**



Hydrogen

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次世代エネルギー  
社会を切り拓く!



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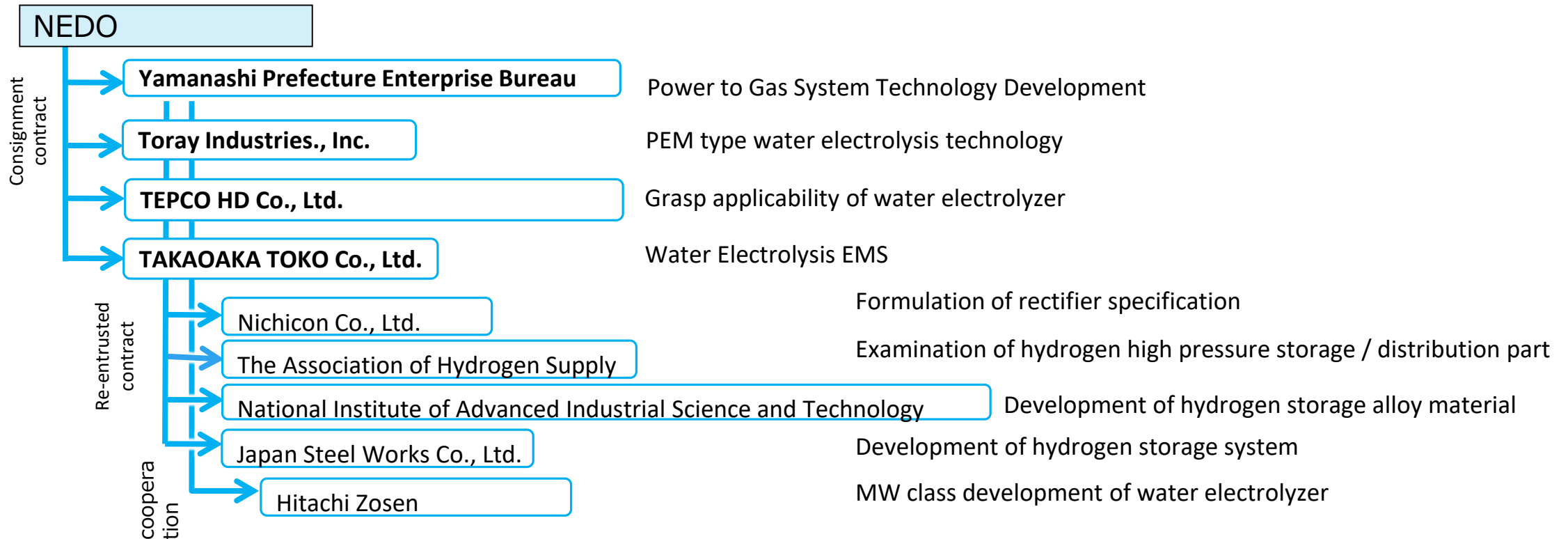


## Power to Gas System Technology Development(FY2016-21)





# Project Framework



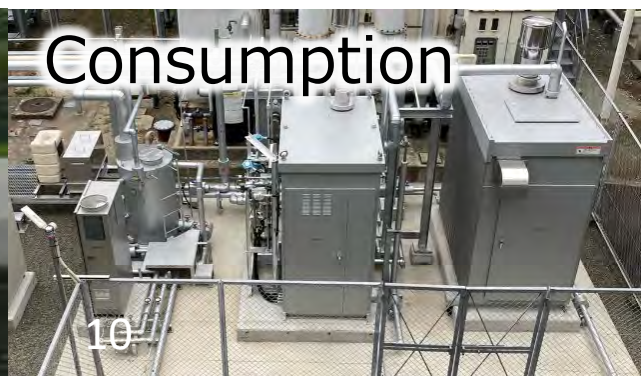
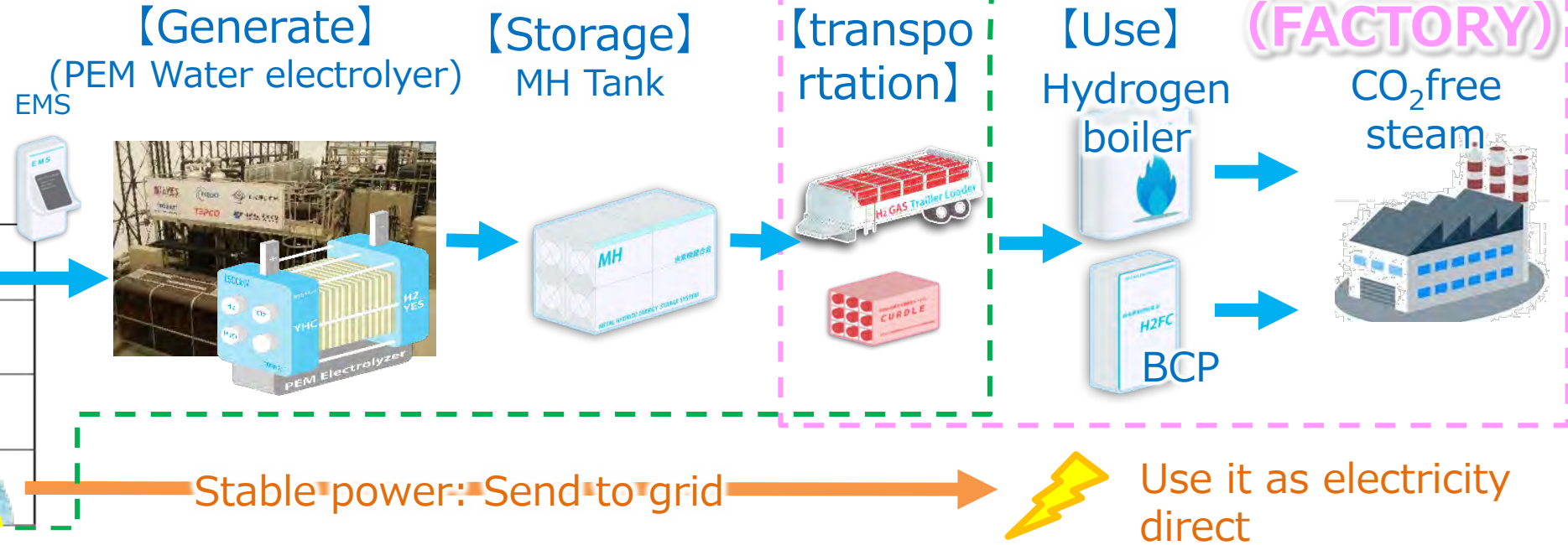
### <Research cooperation>

Yamanashi Prefecture  
 Hydrogen utilization demonstration cooperation company MIURA CO.,LTD. PANASONIC  
 Hydrogen user Hitachi Power Semiconductor Device, Ltd., Super Market OGINO  
 University of Yamanashi Yamanashi Hydrogen & Fuel Cell Network Association



# Practice! Generate hydrogen, and use it for heat in actual factory

"Stable power" is using as "electricity", and "unstable" part is converting to hydrogen,  that is important things.





Mt. Kaikomagatake 2966m

Mt. Yatugatake 2899m

KITZ  
41km Away

Hydrogen Use

Yamanashi Pref Office  
KOFU Station

Hitachi Power Semiconductor Device  
6km Away

Hydrogen Use

(2027)New open  
Linear station

Super Market OGINO  
10km Away

Hydrogen Use

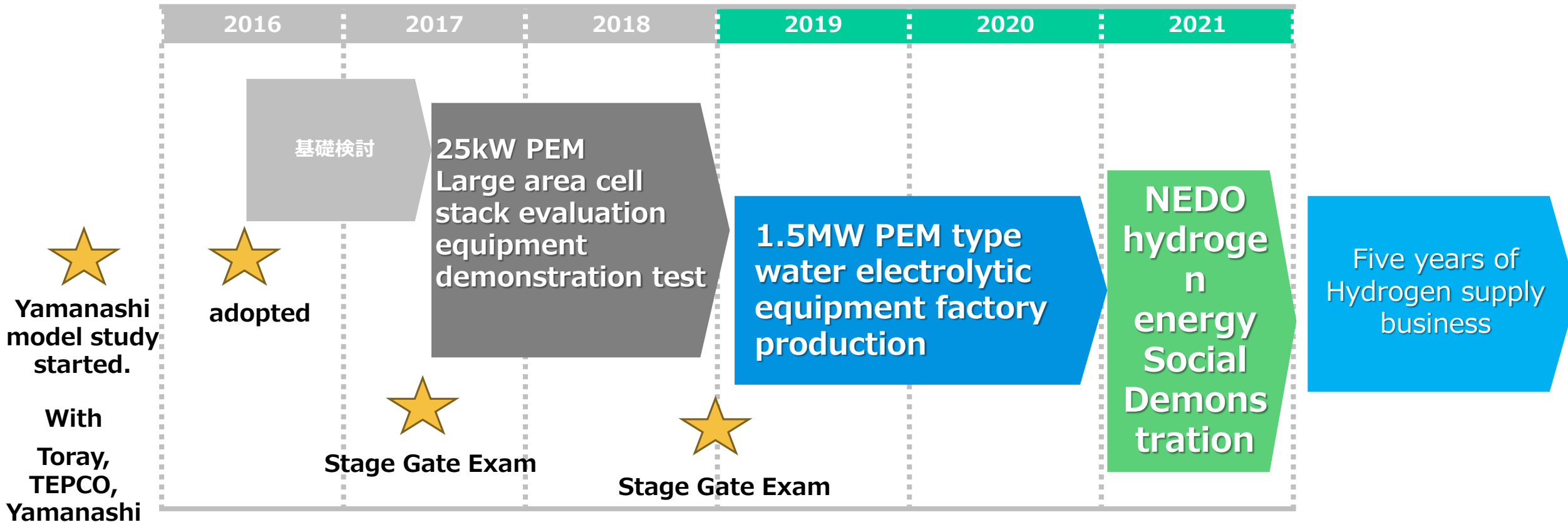
mounds

komekurayama P2G Demo Site

Hydrogen Production



# PEM Technology development Steps



12



# Technology development Steps

✓ Achieve Target efficiency through technological development in collaboration with manufacturers

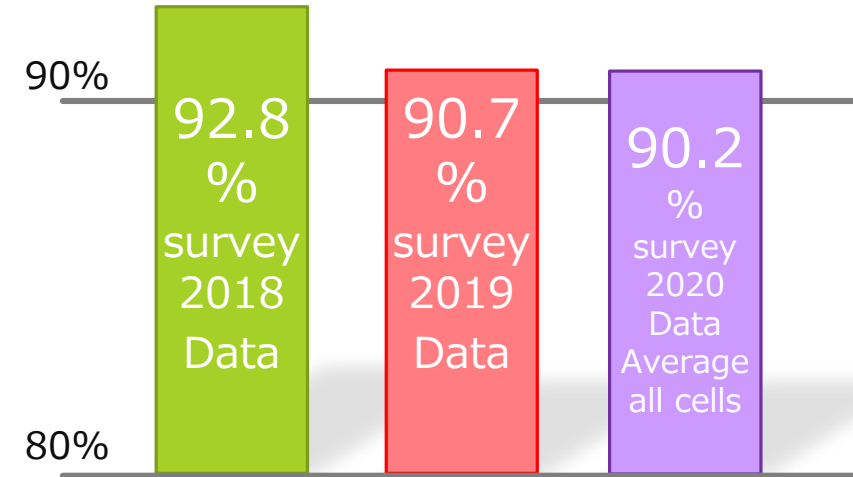
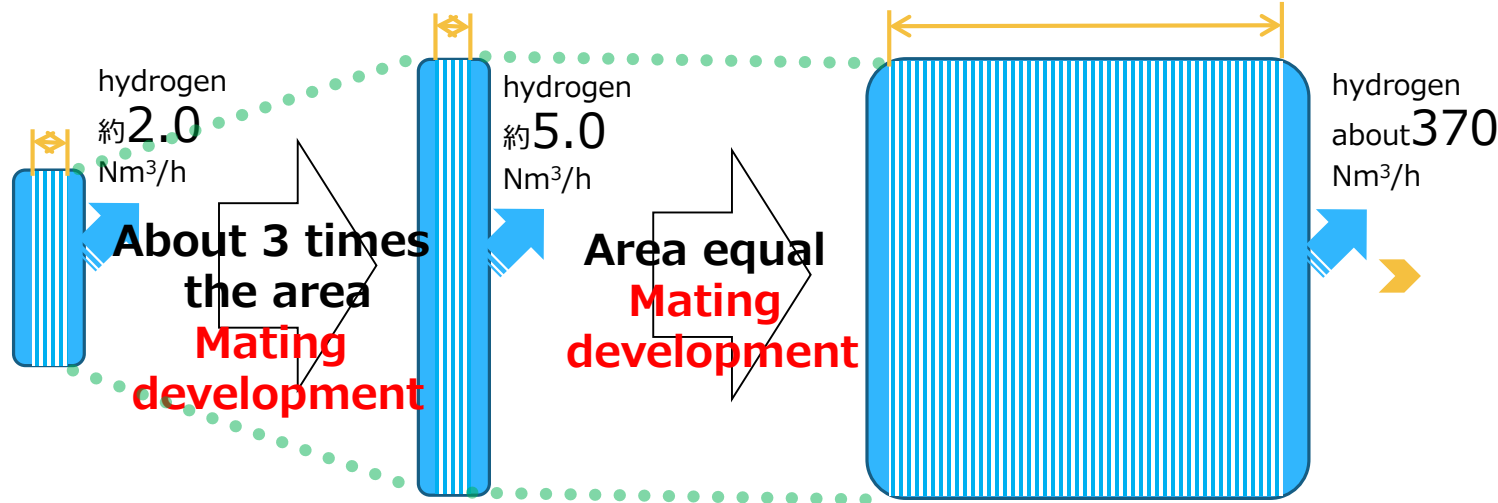
2018~

Voltage = 10V or less  
(few number of cells)

2020~

Voltage = about 210V  
Full Stack × 3

Total efficiency 74%



10kW  
stack

25kW  
Short Stack

1.5MW (MAX2.3MW)  
stack

TORAY MEA18-1

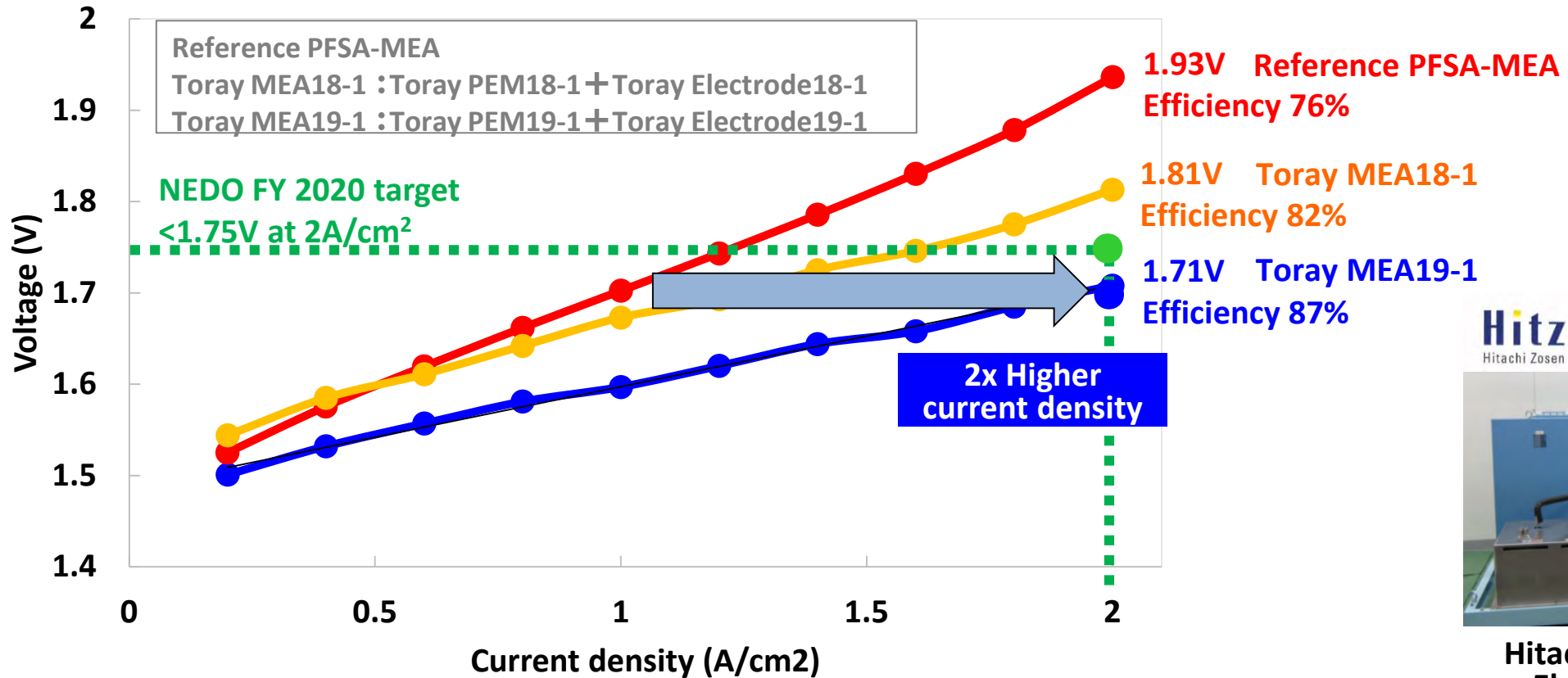
Toray  
10kW

Yamanashi  
25kW

Yamanashi  
1.5MW



# Performance of Prototype Stack



Hitachi Zosen Prototype Electrolyzer in Toray

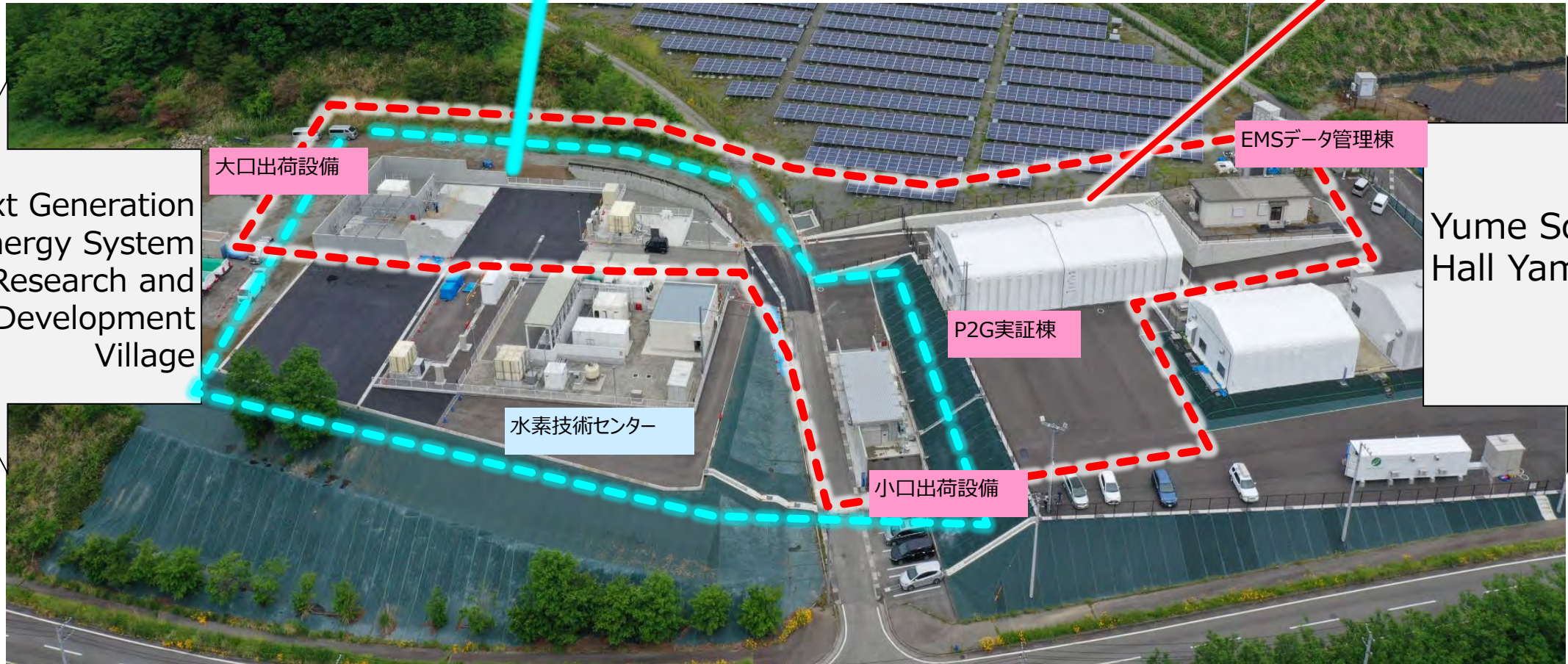
Newly-developed Toray MEA19-1 successfully achieved NEDO FY 2020 final target with keeping lower gas crossover than reference.



# P2G system demonstration facility view

Hydrogen Technology Center Area

P2G Demonstration Facility Area



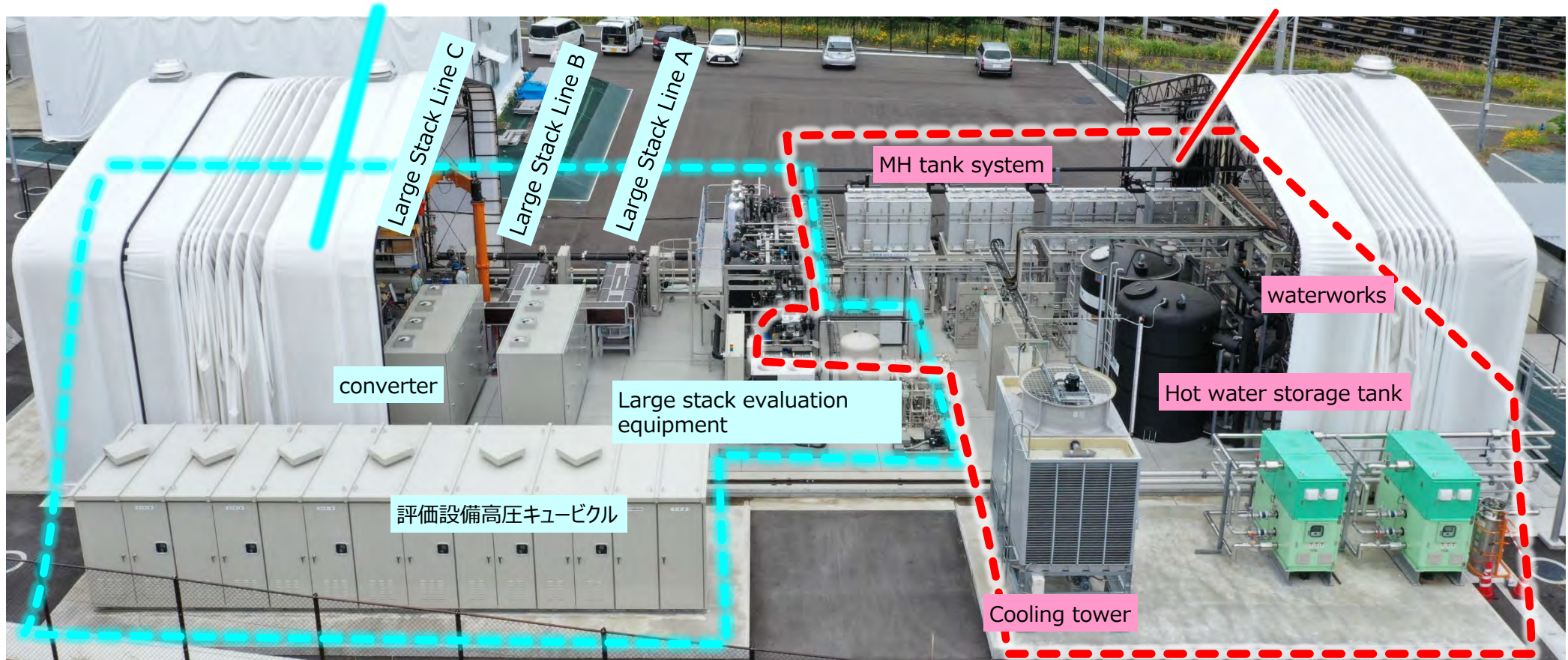
Next Generation Energy System Research and Development Village

Yume Solar Hall Yamanashi

# Large stack evaluation Facility Full view

Large Stack Evaluation Facility Zone

Integrated thermal control system zone







# Hydrogen compression Facility



## Key features

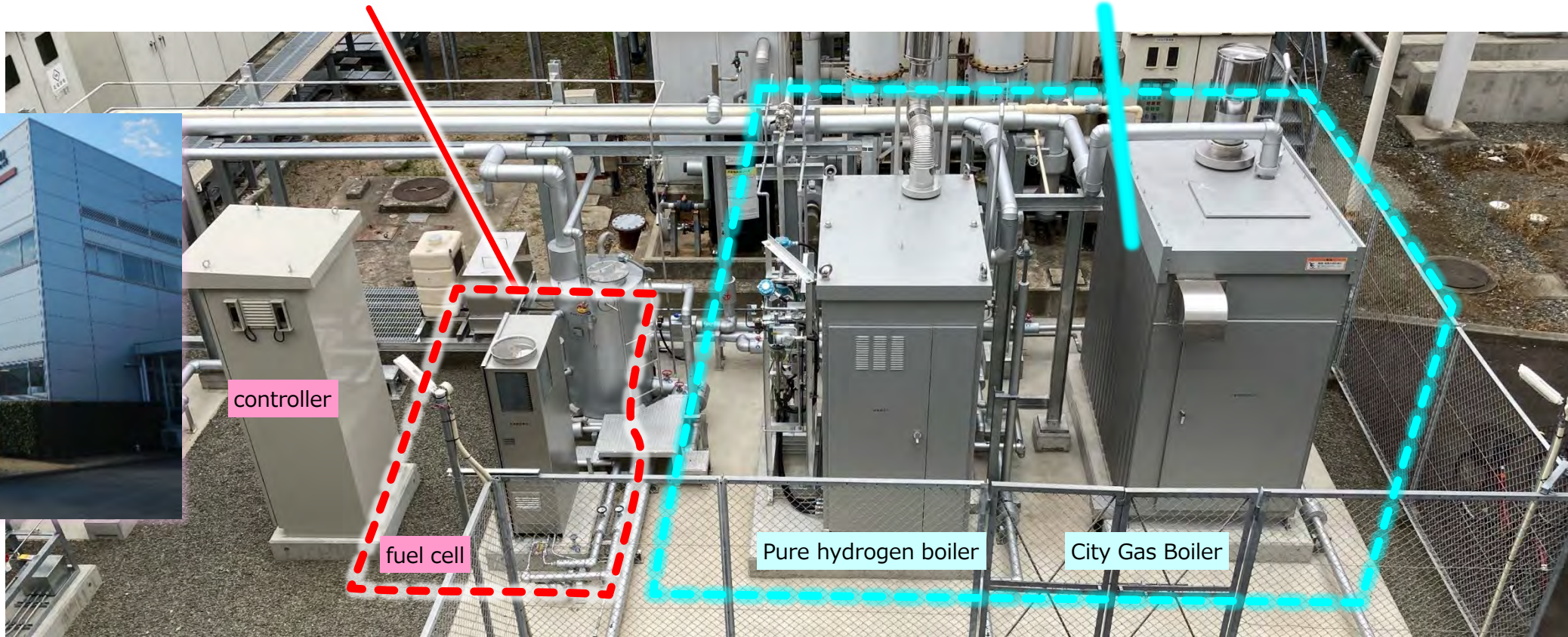
Water electrolytic EMS-linked hydrogen shipping equipment, 2 trailer shipments, 2 cardle shipments Electrolytic cell  
 Pressure 0.6MPa→19.6MPa 400Nm<sup>3</sup>/h



# Hitachi Power Semiconductor Device Demonstration Facility

Fuel cell demonstration equipment

Hydrogen boiler demonstration equipment





# Super Market Ogino Demonstration Facility



Cardle Storage



Pure hydrogen fuel cell



Overview



## Understanding of 2.3MW PEM type electrolyzer by actual operation

**Energy  
consumer  
familiar**

### High quality

- ◆ No post-processing required

### Relief

- ◆ Easy maintenance and no specialized knowledge

### Compact

- ◆ Maximum system efficiency is possible in MW class

**High  
performance**

### High efficiency

- ◆ Double the amount of hydrogen

### High responsibility

- ◆ Supply adjustment power

### Effective use of precious metals

- ◆ Noble metal reuse technology required

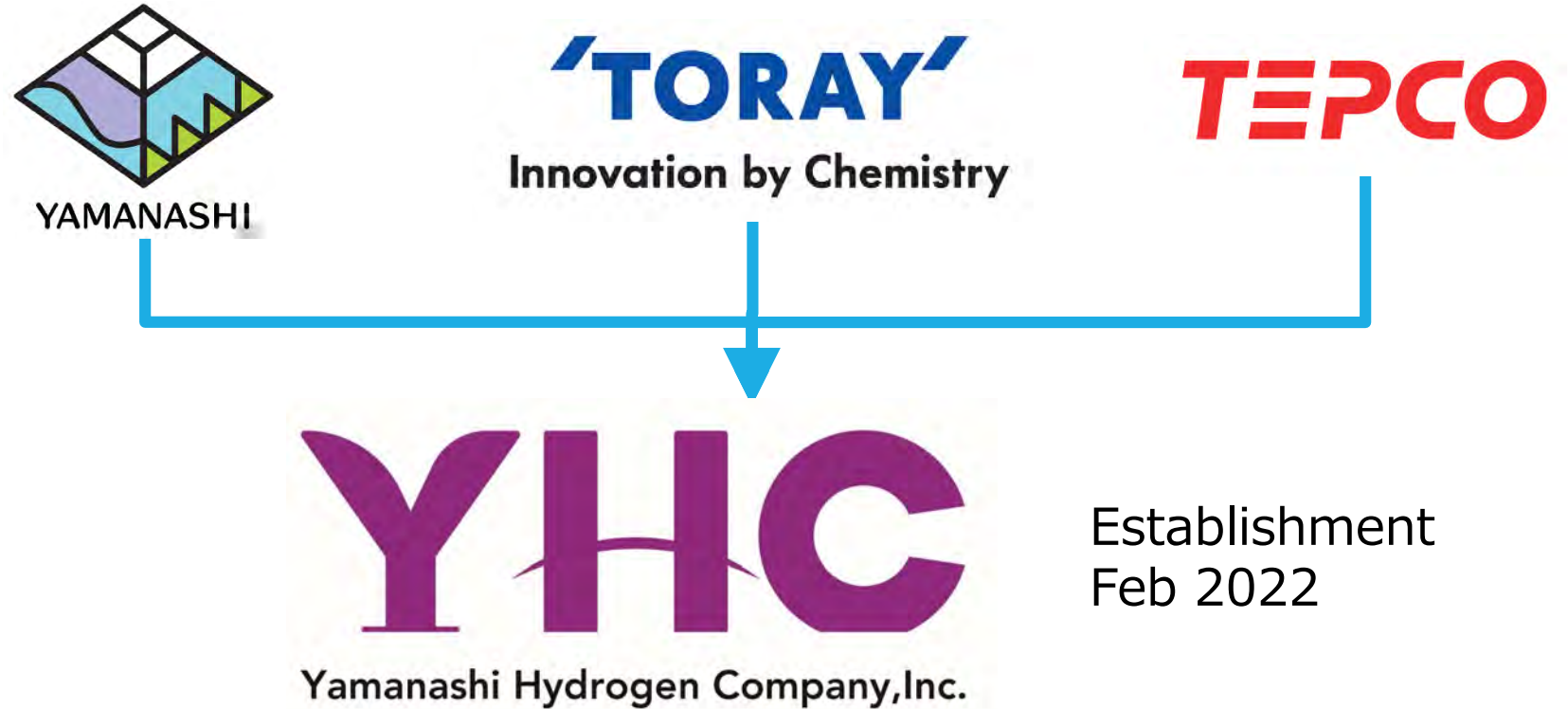
We Judge that water electrolysis technology can be established as a distributed power technology that supports and promotes the expansion of renewable energy.



## Yamanashi Hydrogen Company(From FY2021)



# YHC is the first company in Japan to specialize solely in Power-to-Gas



## Industrial Carbon Neutrality

- ✓ In regions where electrification is difficult, energy transition away from fossil fuels



● Green Innovation Funding Program(2021~25)

● Local Model P2G system Technology Development Program(2021~25)



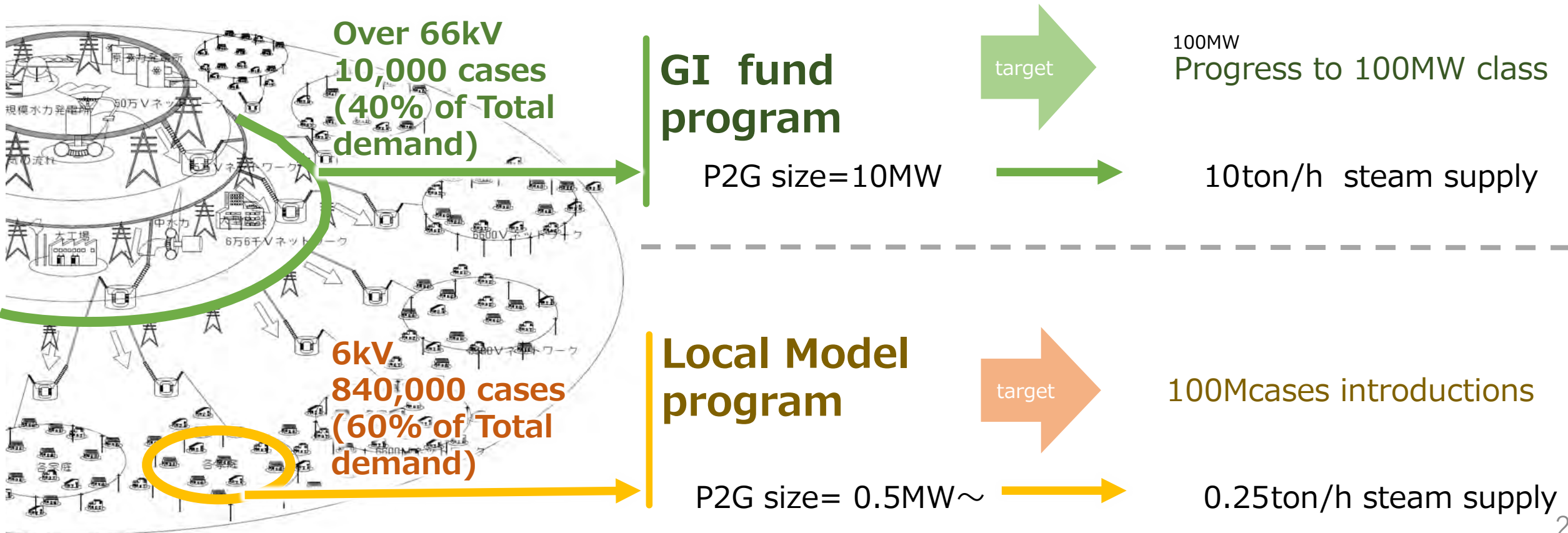
# Business direction

GI fund

- Converting the heat demand of large-scale consumers to hydrogen.
- Scale up from 10MW class to 100MW.

Dome stic

- Build a small package model and spread it widely in the domestic market.





16MW PEM P2G Green Hydrogen Demonstration Site !

# Suntory Hakushu Distillery and Suntory Minami Alps Hakushu Water Plant

located in Yamanashi Prefecture

© 2014 Hokuto City

Consortium members usher in a new era of energy transition



**SUNTORY**



**TEPCO**

**'TORAY'**  
Innovation by Chemistry



**Hitz** 日立造船株式会社  
Hitachi Zosen

**SIEMENS**  
energy

**MiURA**



**nichicon**

# Grand Master Factory of Decarbonization !

UCC 国内焙煎所(UCC coffee Roasting Plant)

大成ユーレック川越工場(TAISEI precast concrete Factory)

located in Saitama Prefecture



**UCC**  
ひと粒と、世界に、愛を



地図に残る仕事。®



**TEPCO**



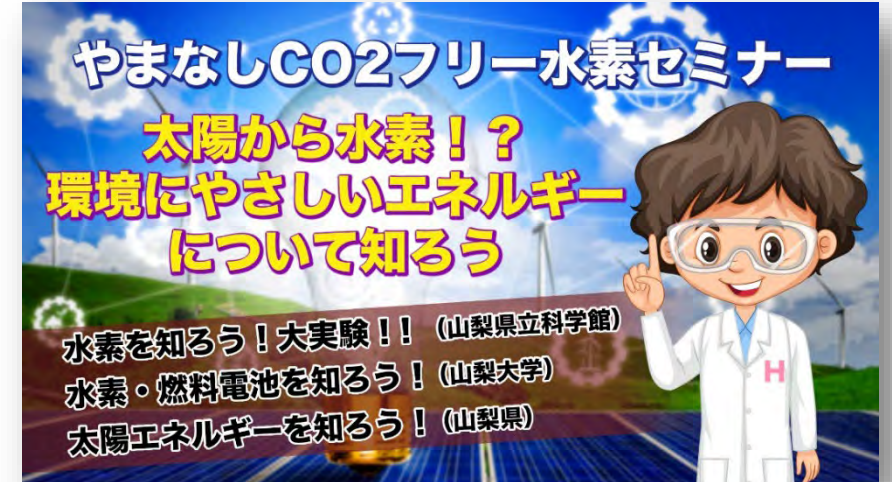
**'TORAY'**  
Innovation by Chemistry



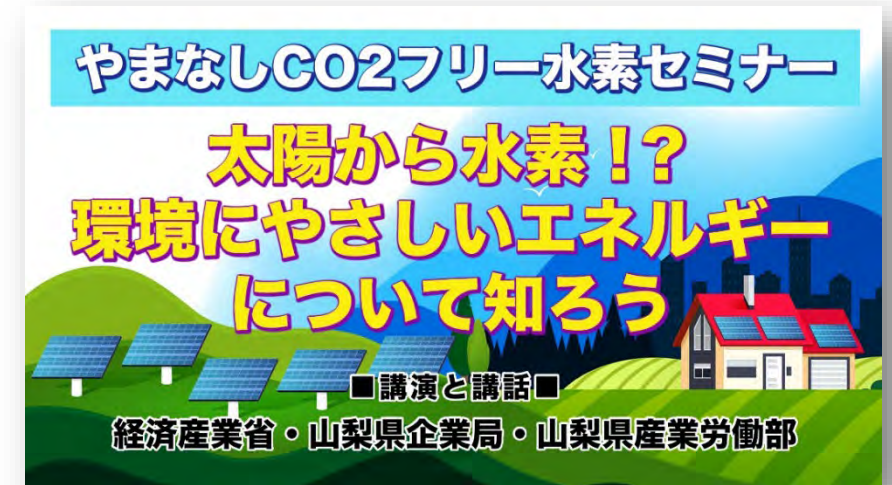
<https://www.youtube.com/watch?v=I3DebQYdWyk>



<https://www.youtube.com/watch?v=ajsG6CtPmJ4>



<https://www.youtube.com/watch?v=mt5Gp7SkodU>





***From Yamanashi to the world, and from the world to Yamanashi***

We will do our utmost to make this project a leader in the global trend of hydrogen utilization toward carbon neutrality. We will do our utmost to ensure that this project will lead the global trend toward the use of hydrogen to achieve carbon neutrality.

Thanks to METI and NEDO for our project support