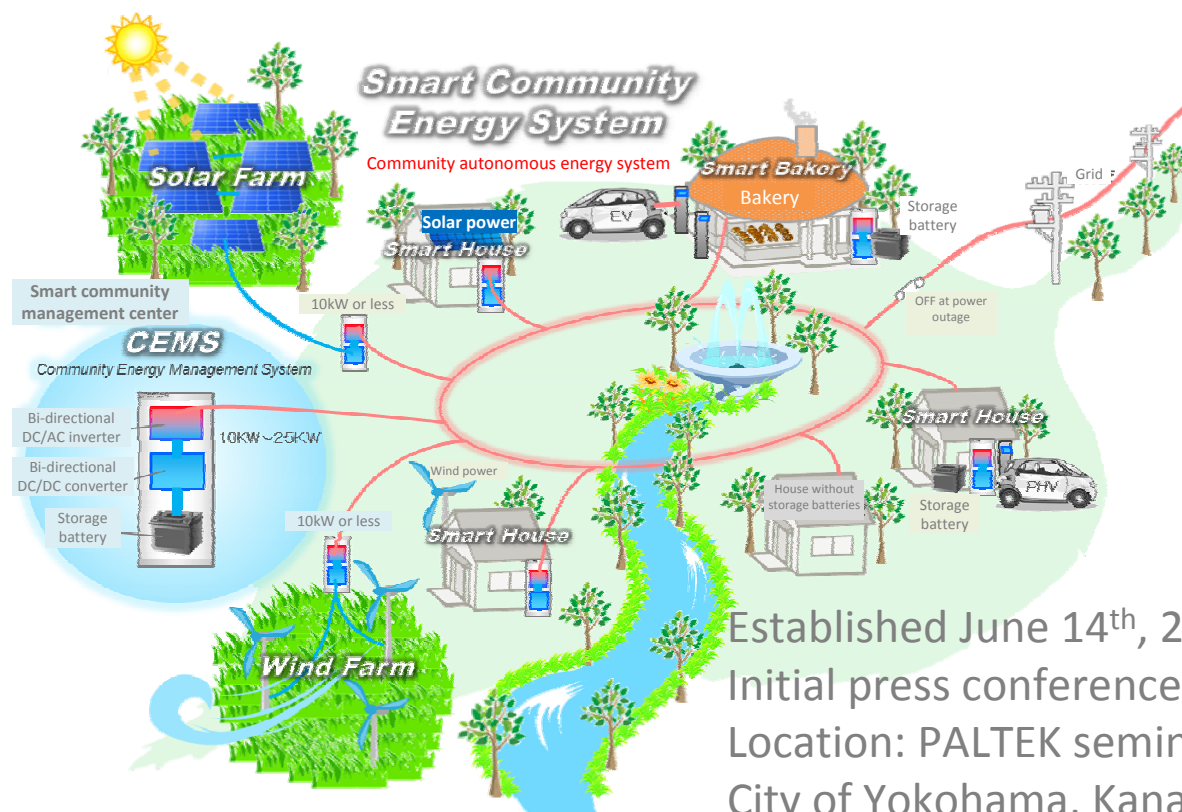


Yokohama Smart Community

Building a smart energy system to support communities of the future



For initial briefing session

Established June 14th, 2011

Initial press conference: 3pm June 14th (Tues)

Location: PALTEK seminar rooms, 2-3-12 Kouhokua-ku,
City of Yokohama, Kanagawa Prefecture

Agenda

- Based on the results of the Fukuoka Smart House Consortium
- What is the Yokohama Smart Community?
- Creating secure and plentiful future communities.

The Fukuoka Smart House Consortium Concept

The Fukuoka Smart House Consortium

Develop and verify an autonomous distributed energy system for individual houses in accordance with the vision of Yoshimichi Nakamura (CTO and founder of Smart Energy Laborator) - 'building a community learning from and using nature'.

- Establish a practical and achievable vision for the system of the future using natural energy. This vision is being implemented by a combined industry-government-academic grouping of more than 30 businesses and academic organizations.
- Built an innovative autonomous energy system.
- Voluntary activities, combined with cooperation and mutual respect between the parties, resulted in a high level of technical sophistication.



The Yokohama Smart Community Concept

The Yokohama Smart Community Concept

- Obtain the support of the participating businesses in the Fukuoka Smart House Consortium, Yokohama businesses and academic organizations, and the City of Yokohama.
- Integrate natural energy between houses on the grid to expand an autonomous energy system for the community. Provide an environment for standardization of the grid and equipment, and testing and evaluating connection.
- A positive and harmonious relationship between the roads and buildings providing the means for daily life, and the natural environment of rivers and hills, is necessary to ensure that people within the community are able to live full and useful lives. Provide an environment to facilitate the art in life.
- Provide opportunities for communication between residents which suits the diversity of the unique Yokohama lifestyle.
- A project to last for a 100 years, building, improving, and evolving.



Composition of the Yokohama Smart Community

- Inauguration : June 14th 2011
- Officers :
 - Representative ■ ■ ■ Hitoshi Arima, President dSPACE Japan K.K.
 - Deputy representative ■ ■ ■ Yoshimichi Nakamura, CTO and founder, Smart Energy Laboratory
 - Tadahito Takahashi, President PALTEK
- Members :

dSPACE Japan K.K.	Zephyr
Smart Energy Laboratory	Texas Instruments Japan
PALTEK	NIDEC Corporation
AVAL Nagasaki	PASSPORT
Abe Koji Architect & Associates	Honda Soltec
Ando Corporation	Murata Manufacturing
Oga Kensetsu	Yazaki Corporation
Star Engineering	Wireless Glue Network
IWATSU ELECTRIC CO.,LTD.	
- Rresearch organizations :
 - Energy Electronics Research Laboratories, Sojo University (Professor Nakahara)
 - Power Electronics Research Laboratories, Shibaura Institute of Technology (Professor Takami)
- Advisor : Kiichiro Tamaru, embedded project sub-leader, Software Engineering Center, Information-technology Promotion Agency
 - Yasushi Santo, YS Energy research
- Ssupporting organizations : Yokohama City
- Secretariat : Refer to PALTEK



横浜スマートコミュニティ構成

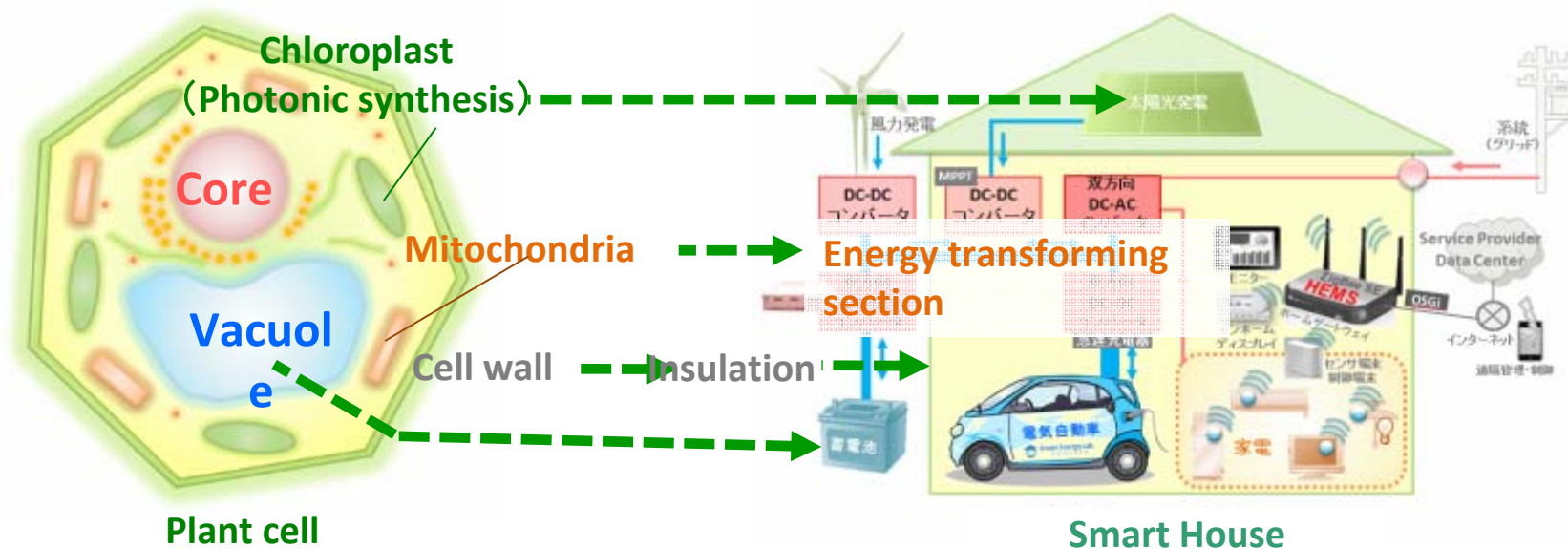


Agenda

- **Based on the results of the Fukuoka Smart House Consortium**
- What is the Yokohama Smart Community?
- Creating secure and plentiful future communities.

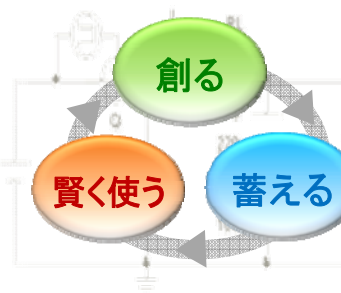
A Concept Based on a View of Life

A sustainable autonomous energy system learning from nature



Strategy of natural life forms
to survive

Realization of Low-carbon society



Realization of an autonomous energy system that generates, stores in, and uses energy cleverly.

Fukuoka Smart House Consortium



Wind power

Demonstration
experiment
house



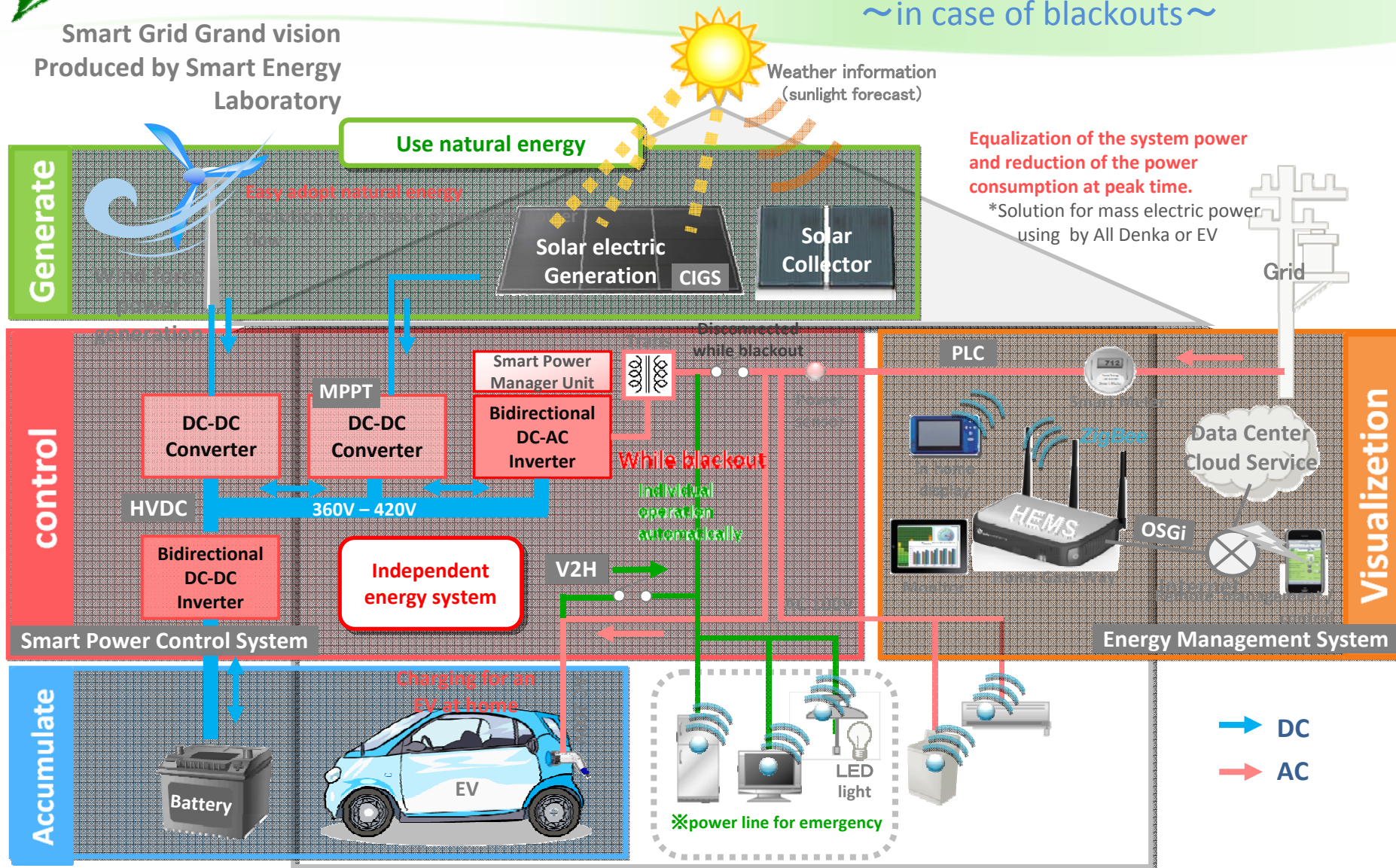
EV



Smart House System Configuration

~in case of blackouts~

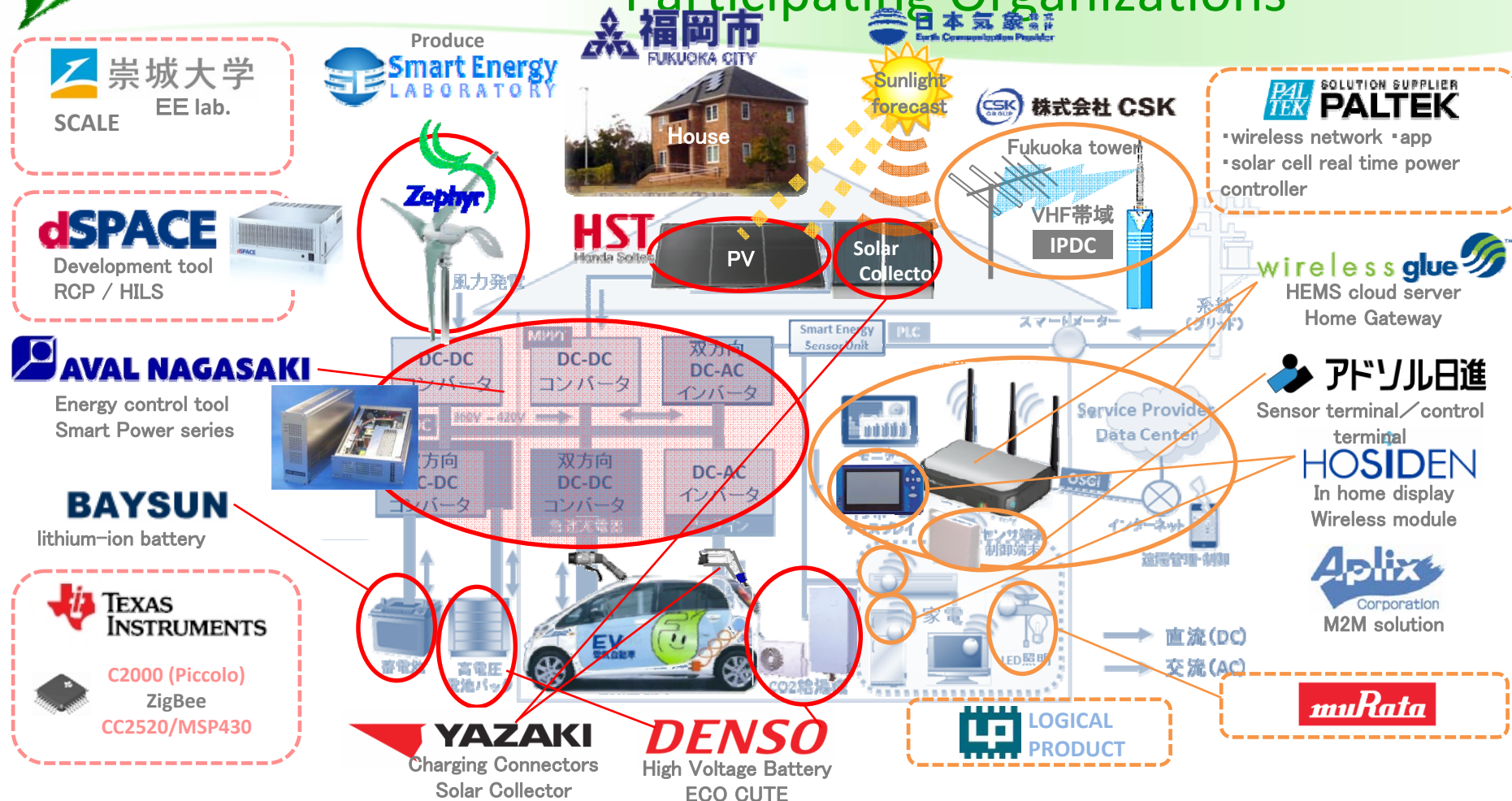
Smart Grid Grand vision
Produced by Smart Energy
Laboratory



MPPT : Maximum Power Point Tracking
HVDC : High-Voltage Direct Current
PLC : Power Line Communication

OSGi : Open Services Gateway initiative
CIGS : Copper Indium Gallium DiSelenide
V2H : Vehicle to Home

The System and Demonstrations by Participating Organizations



Smart Energy System

Home Energy Management System

Smart House System

• Chairman... Smart Energy Laboratory
CTO Founder Yoshimichi Nakamura

• Vice-Chairman... Sojo Univ. EE lab. Prof. Masatoshi Nakahara

dSPACE Japan K.K. President Hitoshi Arima

AVAL NAGASAKI CORPORATION President Yoshimitsu Kawanami

2011/2/16

Fukuoka Smart House Consortium

Concept: Smart Energy Laboratory

Executive Office: dSPACE Japan K.K

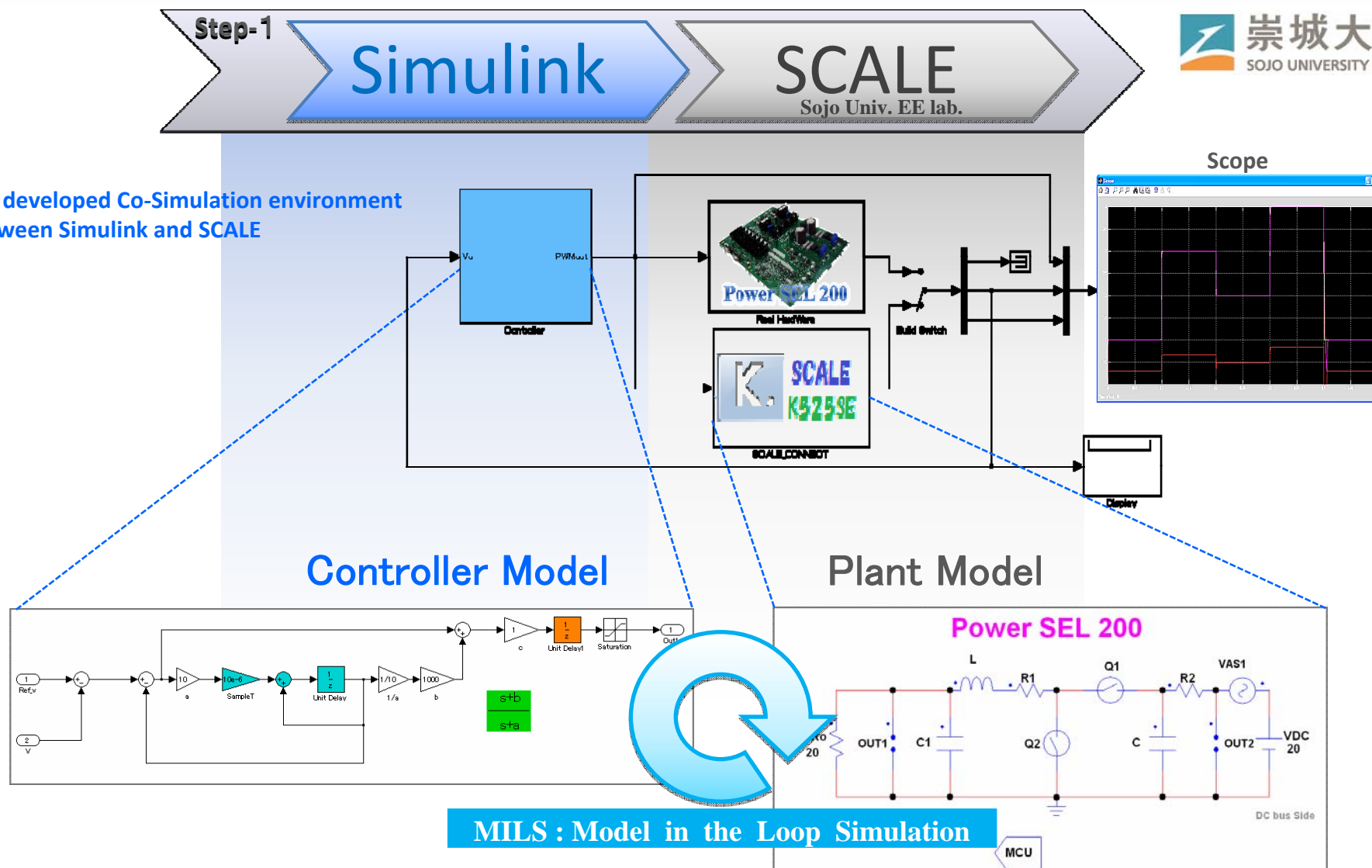
Step-1

Simulink

SCALE

Sojo Univ. EE lab.

We developed Co-Simulation environment between Simulink and SCALE



Intelligent Power Supply Development Flow with the Model-based Development Method

Simulation by SCALE
Sojo Univ. EE lab.
Prof. Masatoshi Nakahara

dSPACE
Visualize by
ControlDesk

dSPACE
Prototyping tool
DS1103

Control

Board

Step-1

Simulink

SCALE
Sojo Univ. EE lab.

Step-2

dSPACE

Step-3

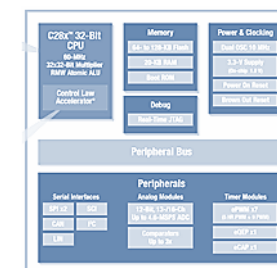
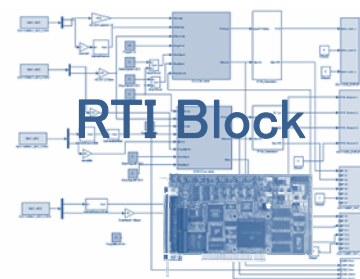
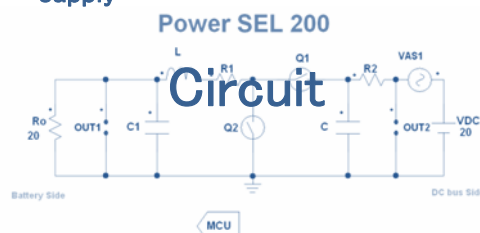
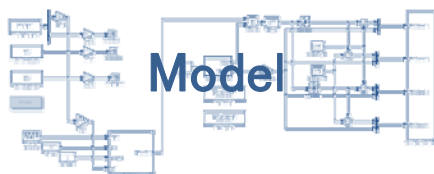
Piccolo™

Design the controller model

Design and trial
SCALE can simulate switching
power supply

Using dSPACE prototyping tool,
and trial RCP
(RCP : Rapid Control Prototyping)

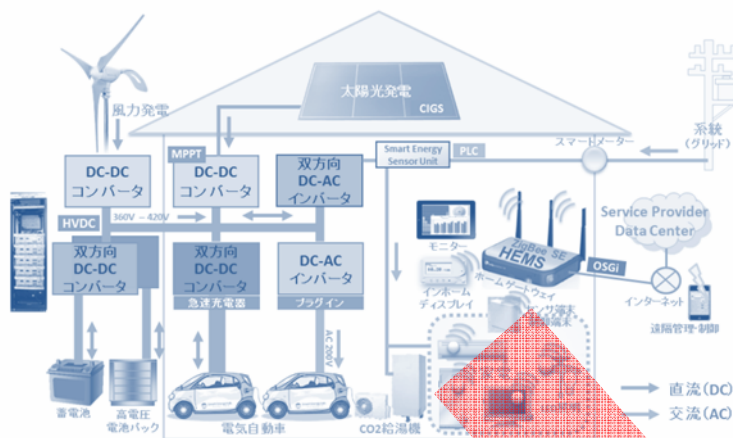
The model that has already
checked at RCP is implemented
into the processor.



(R&D: Smart Energy Laboratory, dSPACE Japan)

From Vision, to Model, to Demonstration

Grand Vision

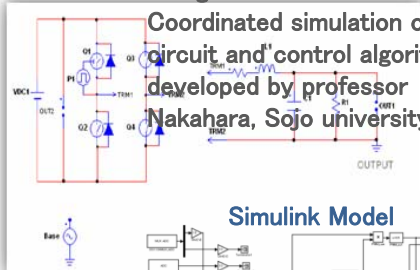


Island city central park
brick house

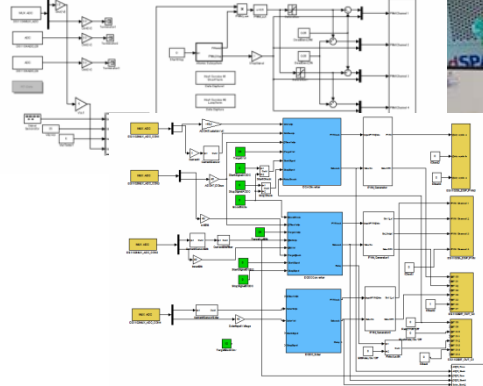
Verification

Using SCALE.

Coordinated simulation of
circuit and control algorithm,
developed by professor
Nakahara, Sojo university



Simulink Model

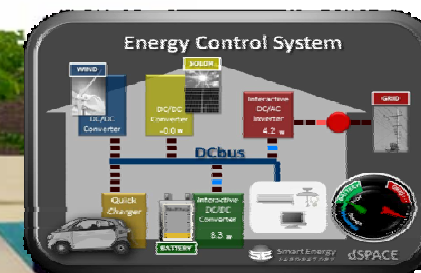


RTI Block by DSPACE

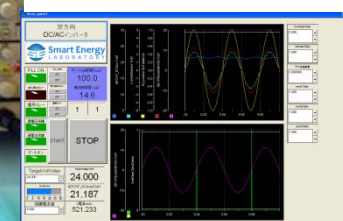
Proof



Smart Mini House

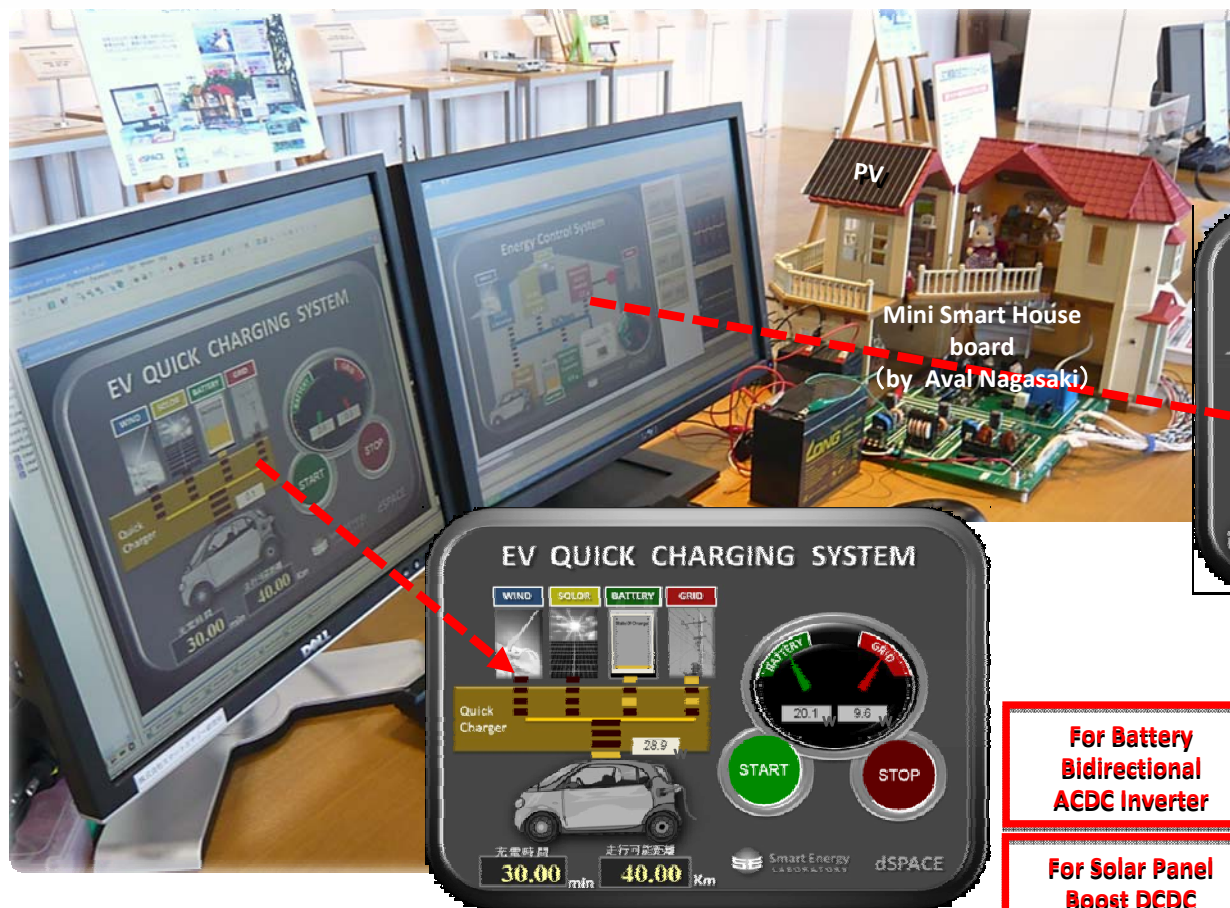


Real time monitor



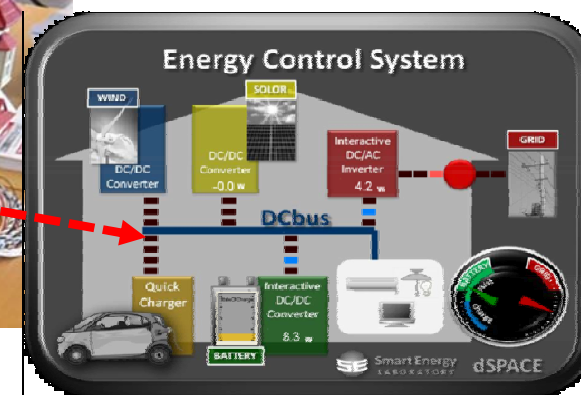
The Mini Smart House

Latest Development Tool

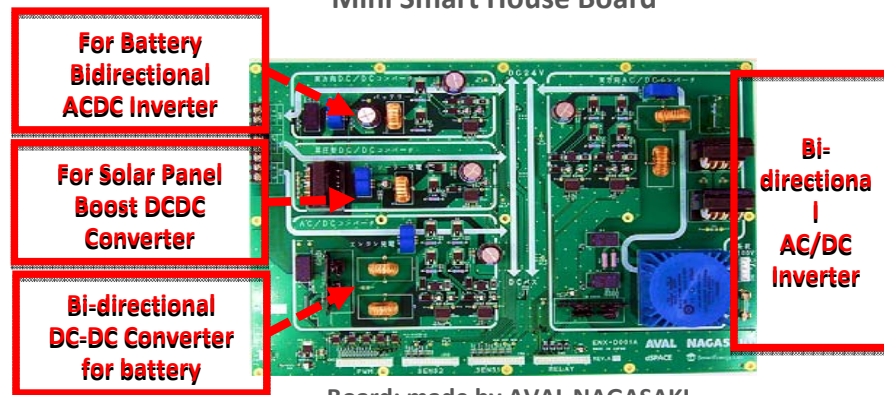


① The Demonstration of Energy Control System which use battery.

(Controlled by DS1103 dSPACE)



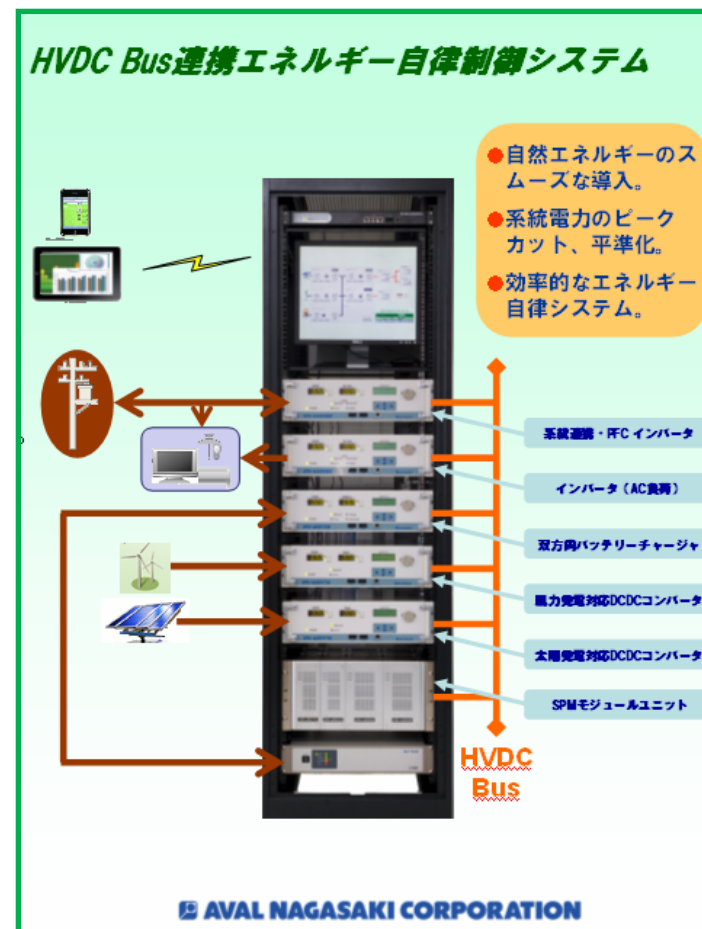
Mini Smart House Board



Board: made by AVAL NAGASAKI

② The Demonstration of EV quick charging

An Energy System Example



資料提供：アパール長崎

Four Benefits of the Smart House



Smooth introduction of natural energy

* Solution to the grid reverse power flow problem

Grid power peak cutting and smoothing

* Power consumption in all-electric home and introduction of electric vehicles

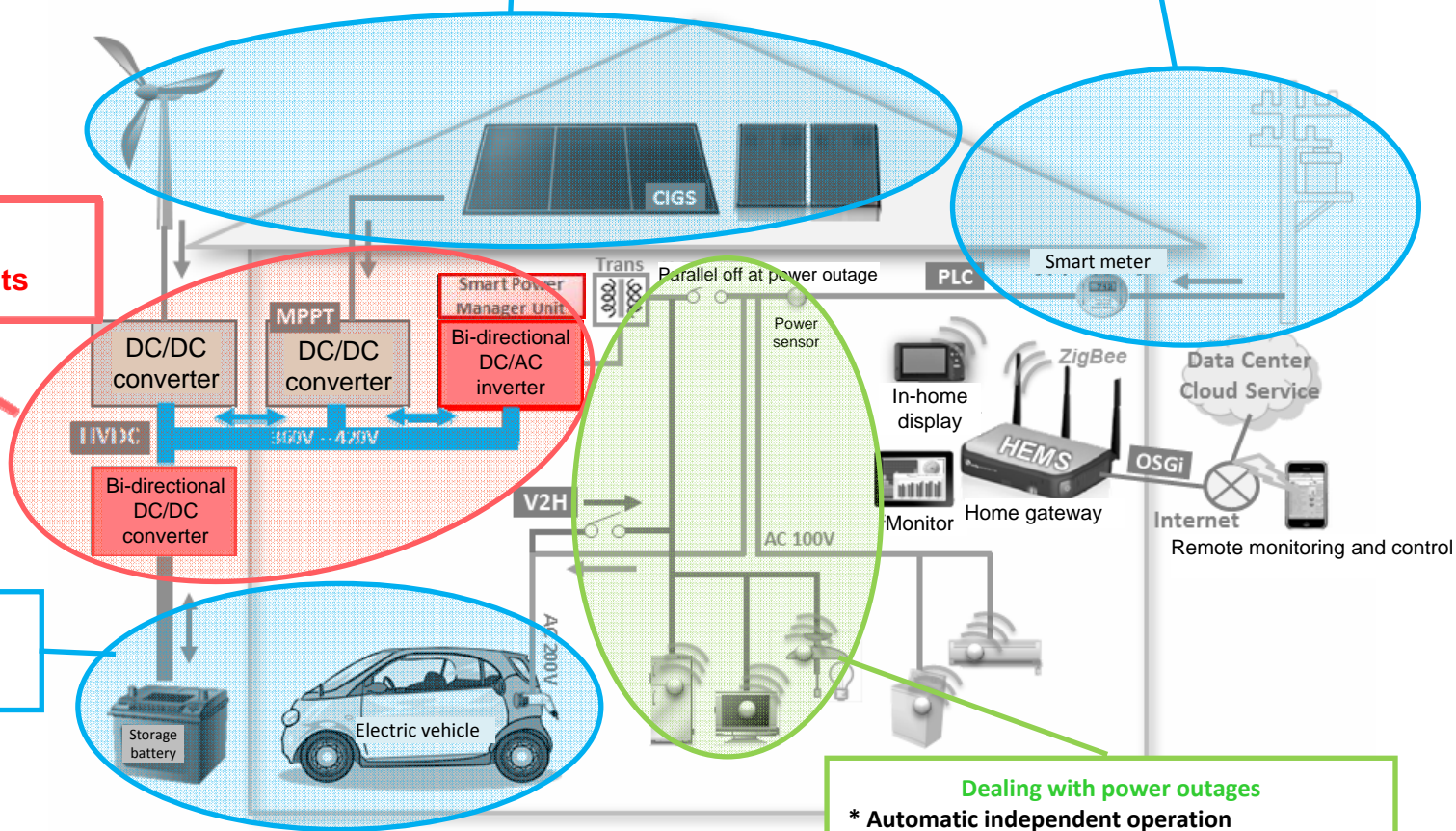
Energy control system required to bring benefits

Charging electric vehicles at home

* Promote use of electric vehicles

Dealing with power outages

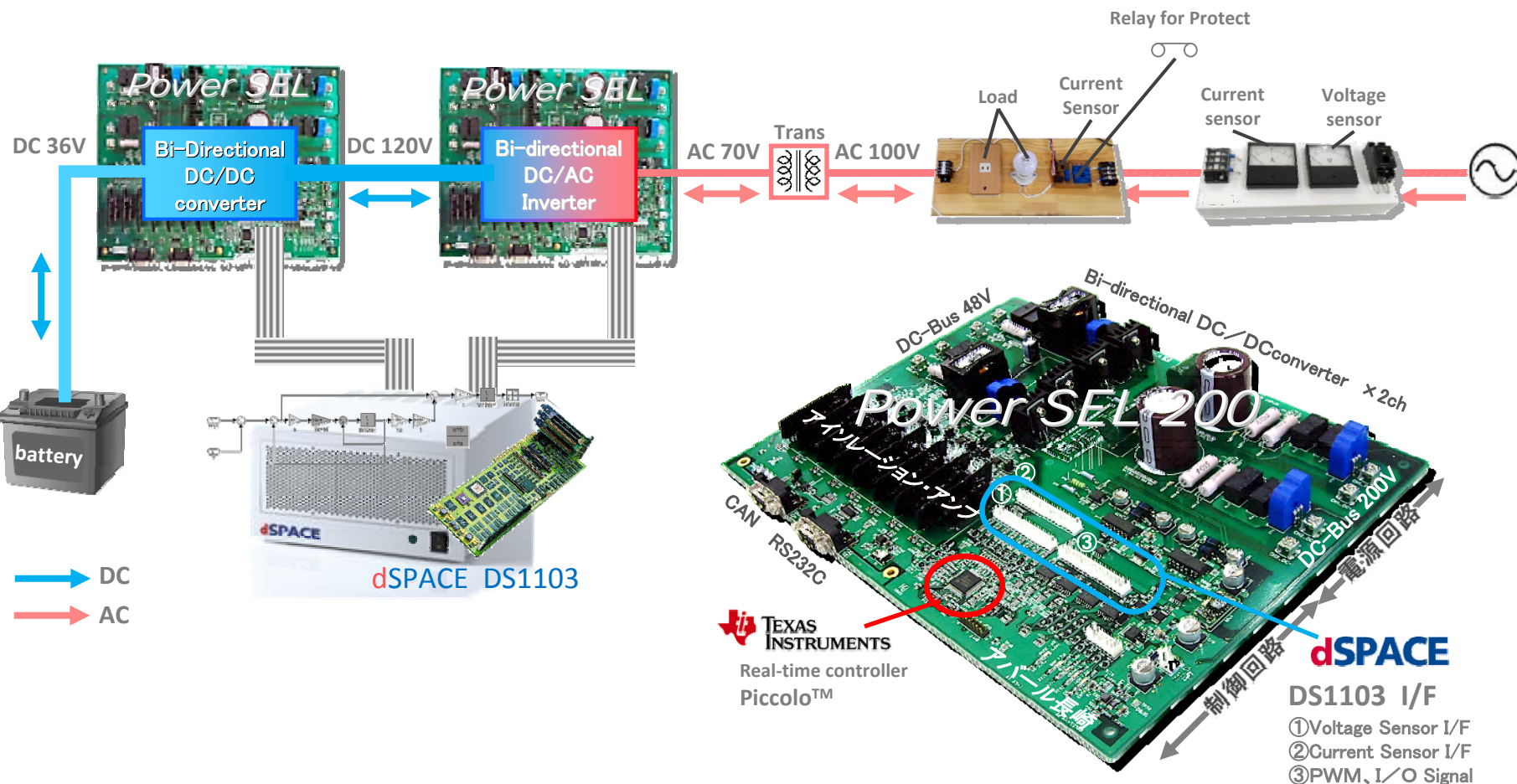
* Automatic independent operation
* Storage battery backup in emergencies



Smart Energy Core System

Model Based Development (Prototype)

- Solution of blackouts
- Battery assist for EV charge
- Grid Peak cut , Equalization



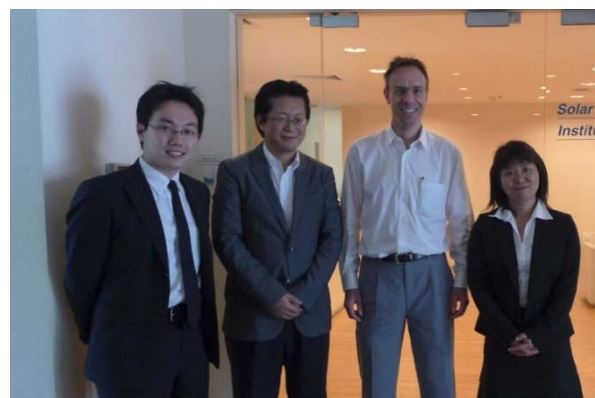
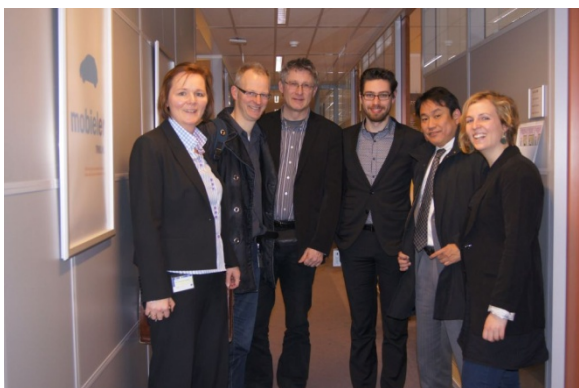
Introducing Energy Control Technology Overseas

- **Introducing the technology to power companies in California at DistribuTECH 2011**



- * Lack of available power (e.g. planned power outages)
- * Obsolete plant limits capacity of power transmission equipment, preventing overnight charging of electric vehicles.
- * Technology such as time-shifting using storage batteries to accommodate the proliferation of electric vehicles, and the use of natural energy, are necessary.

- **Introducing the technology to TNO and Amsterdam University, and technical cooperation**



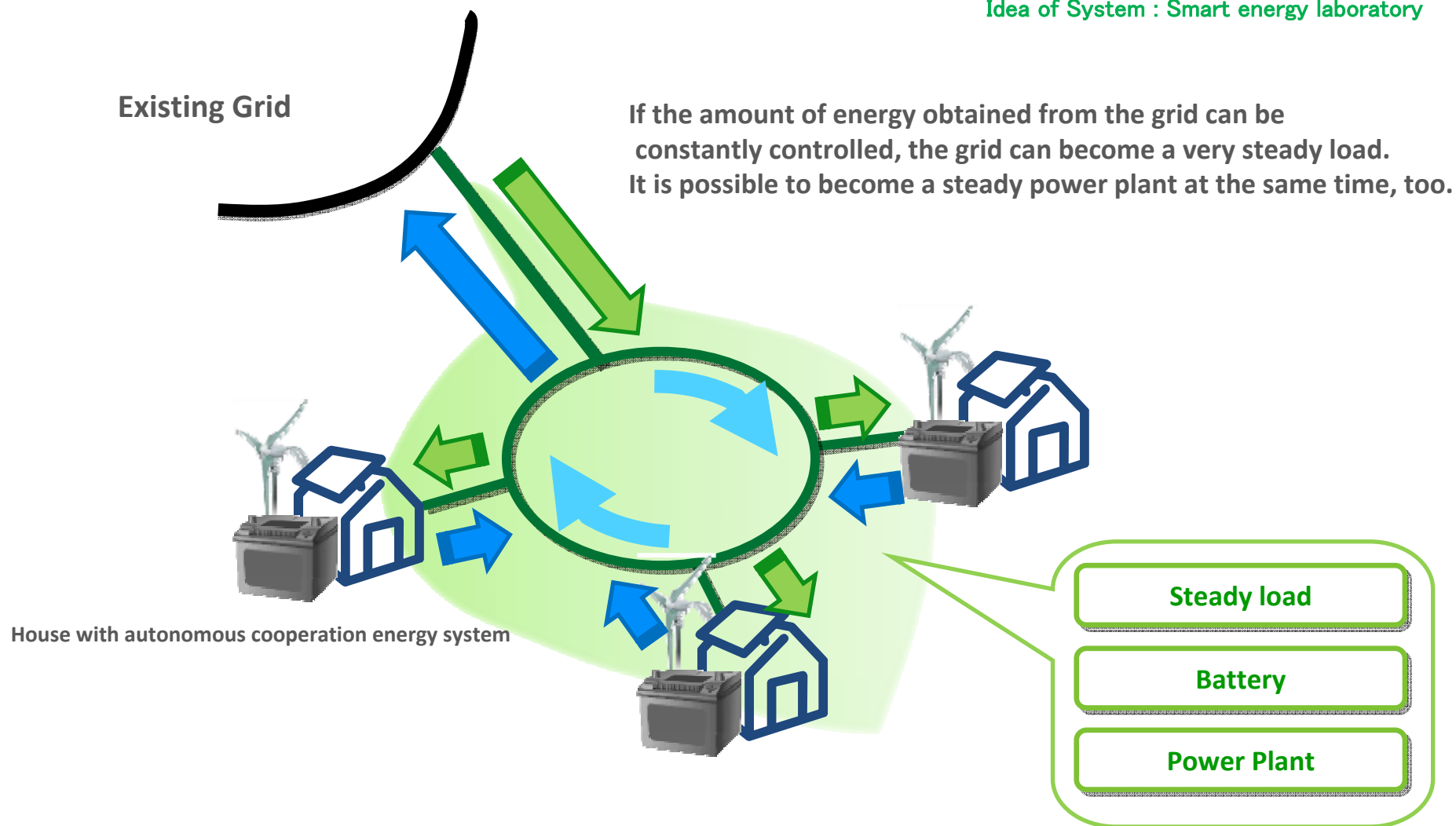
- **Cooperation with the National University of Singapore**

Agenda

- Based on the results of the Fukuoka Smart House Consortium
- What is the Yokohama Smart Community?
- Creating secure and plentiful future communities

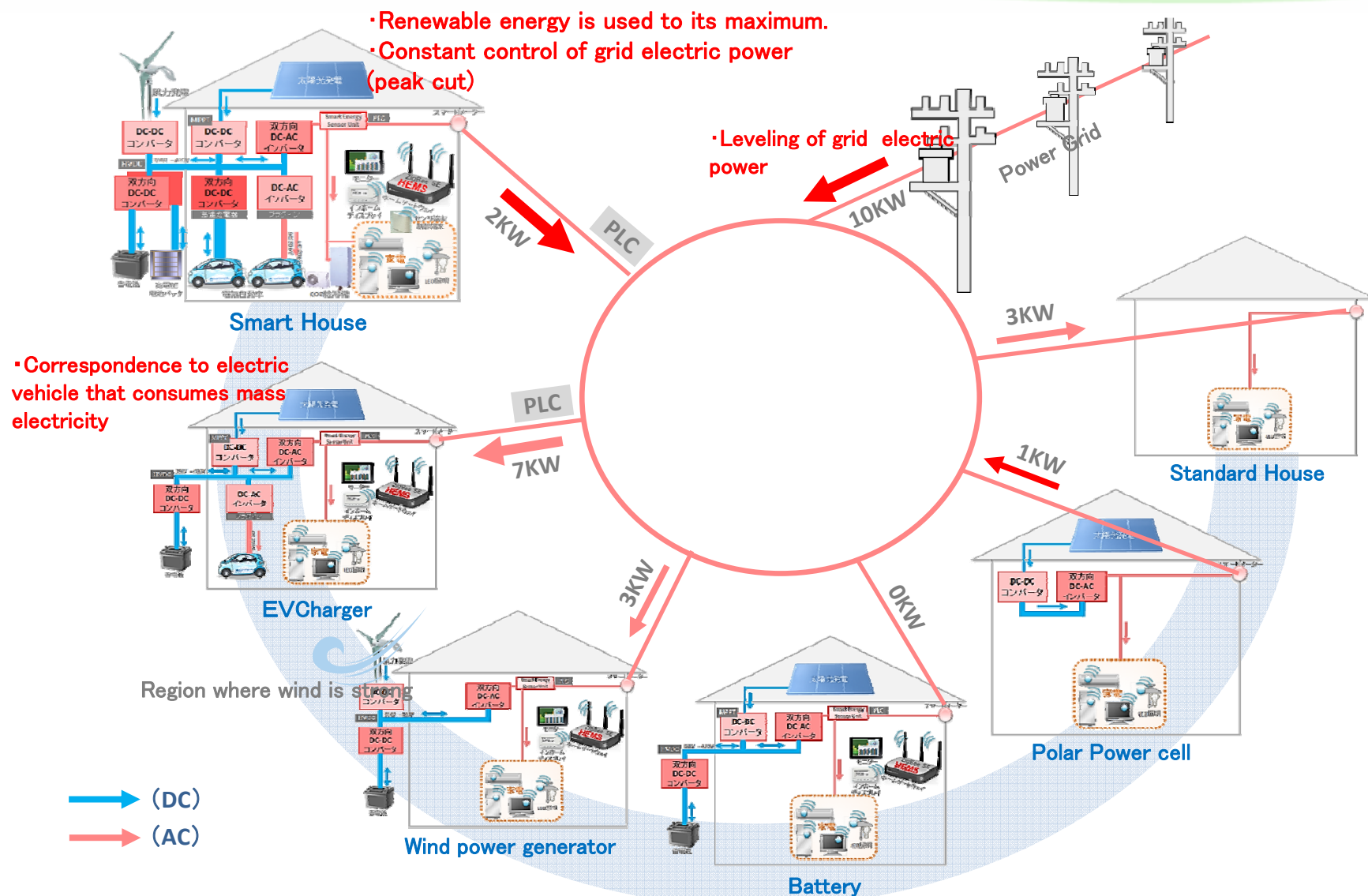
Integrating House-to-house Connections and the Grid

Idea of System : Smart energy laboratory



House-to-house Connections

Mutual energy integration between houses and communities



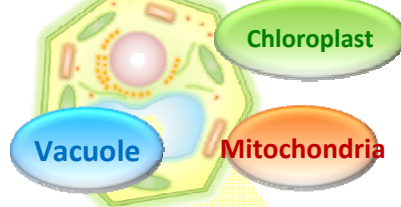
Idea of System : Smart energy laboratory

Expanding the Autonomous Energy System

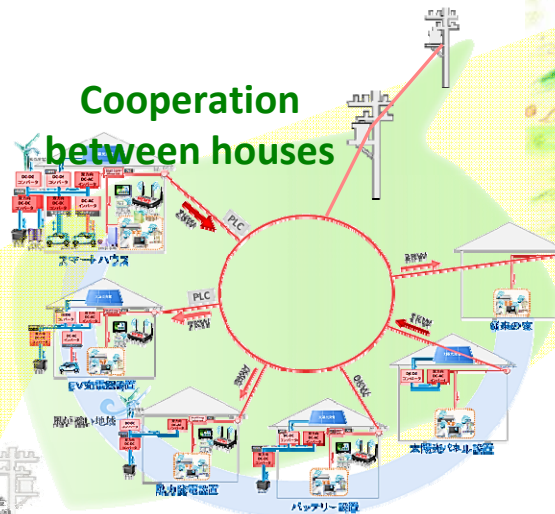


We are based on the concept of “**produce**”, “**charge**”, and “**use wisely**” the energy within a small area. We try to create a system, taking a hint from the completeness of plant cell’s energy.

Planet cell

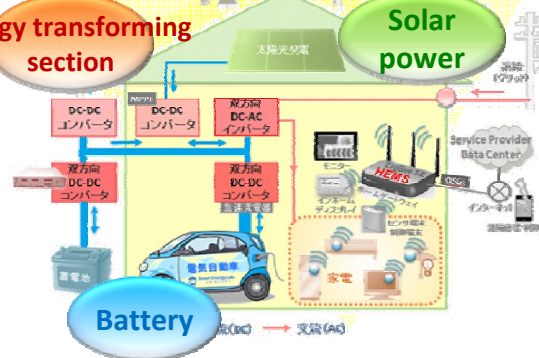


Cooperation between houses



Smart House

Energy transforming section



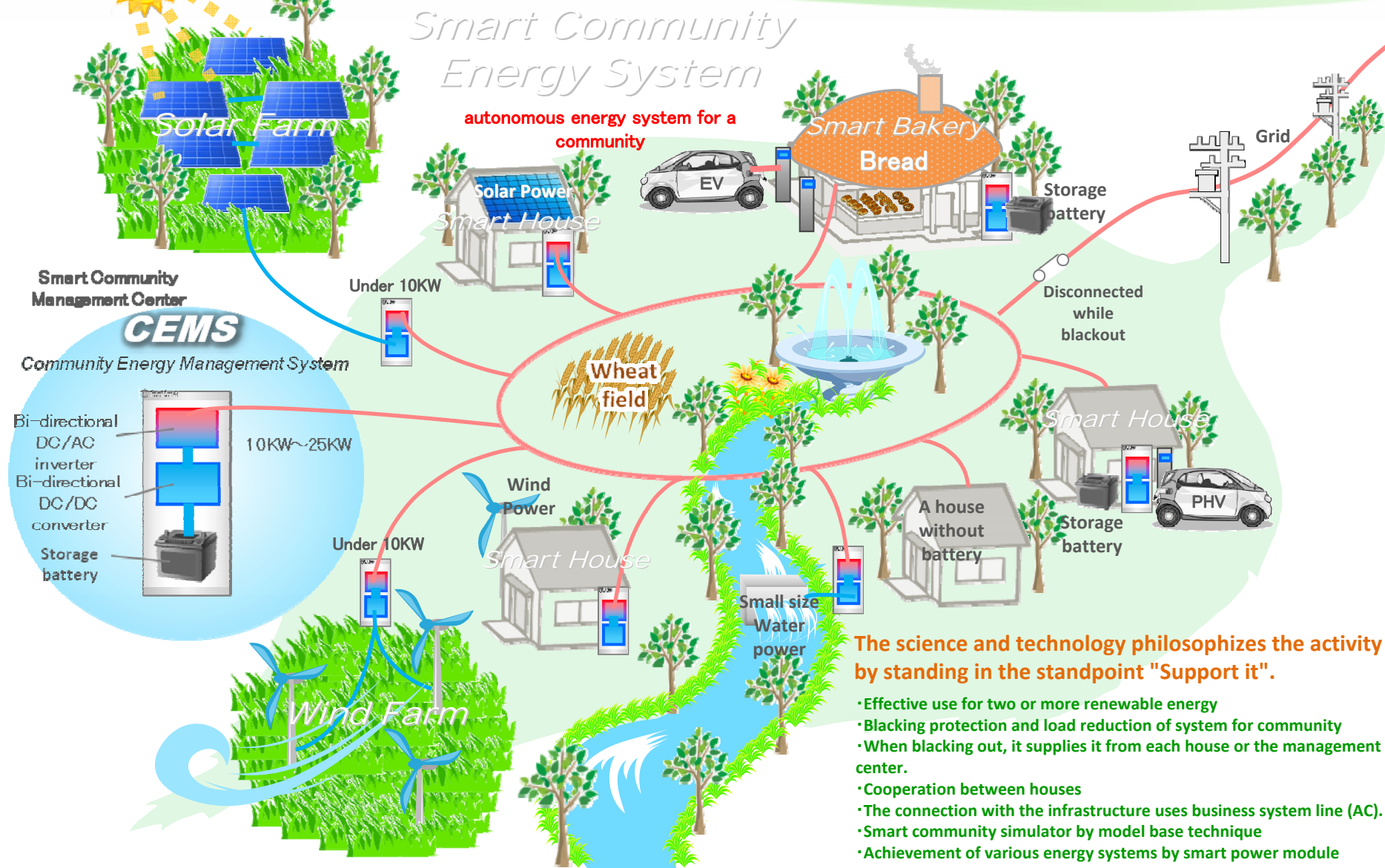
Smart Community



※Grand vision 2009/10/22
Texas Instruments 社 エンジニアリング・コラムへ寄稿。
<http://focus.tij.co.jp/jp/dsp/docs/dspsplash.tsp?contentId=63758>

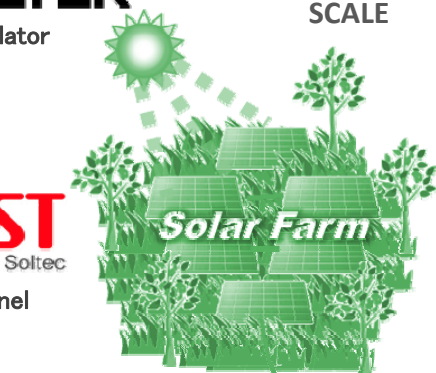
Smart Community Concept

~ Technology support community and culture ~





The Yokohama Smart Community and Participating Businesses



Smart Community Energy System

コミュニティ自律型エネルギーシステム



スマートコミュニティ
マネージメントセンター



Community Energy Management System



風力発電

Smart House



蓄電池を
持たない家

蓄電池

PHV

YAZAKI

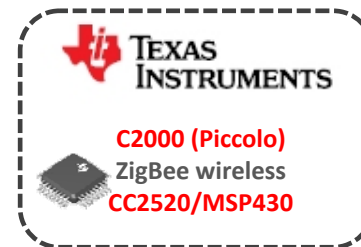
Charging Connectors



Wind power
generation



sensor/wireless module



Principles and Vision

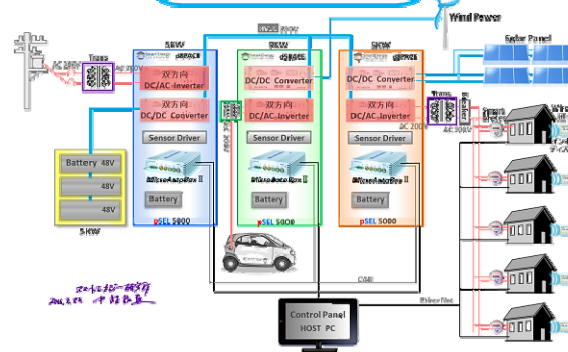


Development of technology to permit energy to be 'Created', 'Stored', and 'Used wisely' in a small world

Portable smart energy system



Smart community energy system



Smart community

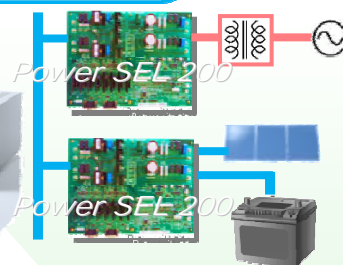


Smart energy basic learning system



Smart energy elemental development system

Prepare prototype



Smart energy introductory texts

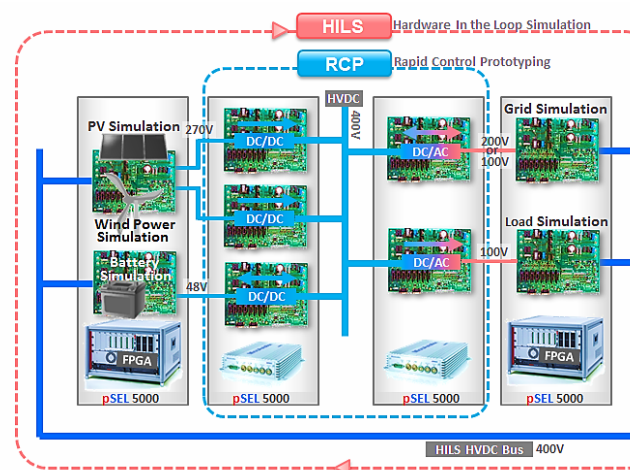


石川元一研究室
中村良直
2011.4.5

Smart power module



Verification system for the age of smart energy

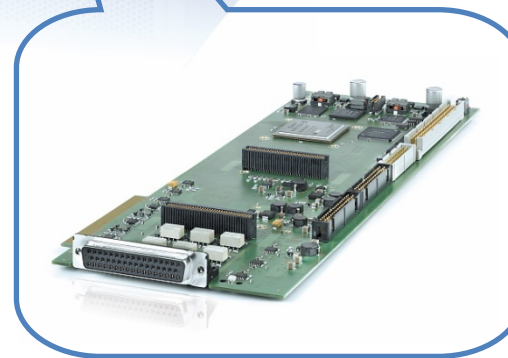
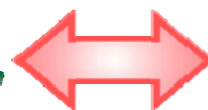
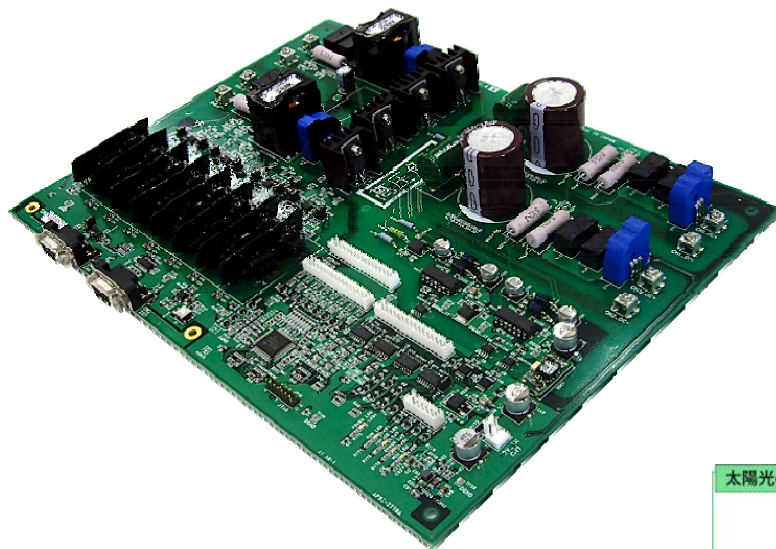


Manufactured by
Aval Nagasaki

Automated testing

Real-time Solar Power Generation Simulator Simulates Solar Cell Power Output

PowerSEL 200



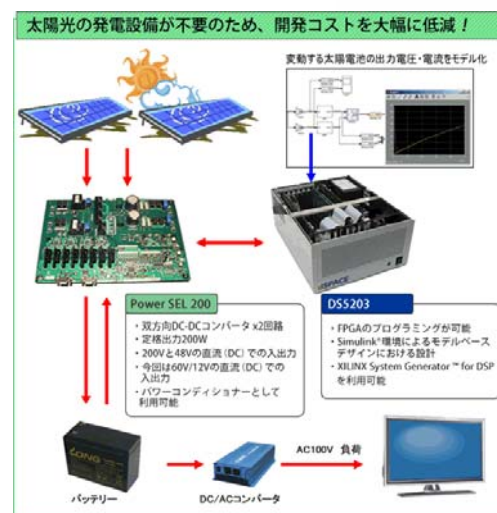
DS5203 FPGA Board

PV simulator Solution from PALTEK

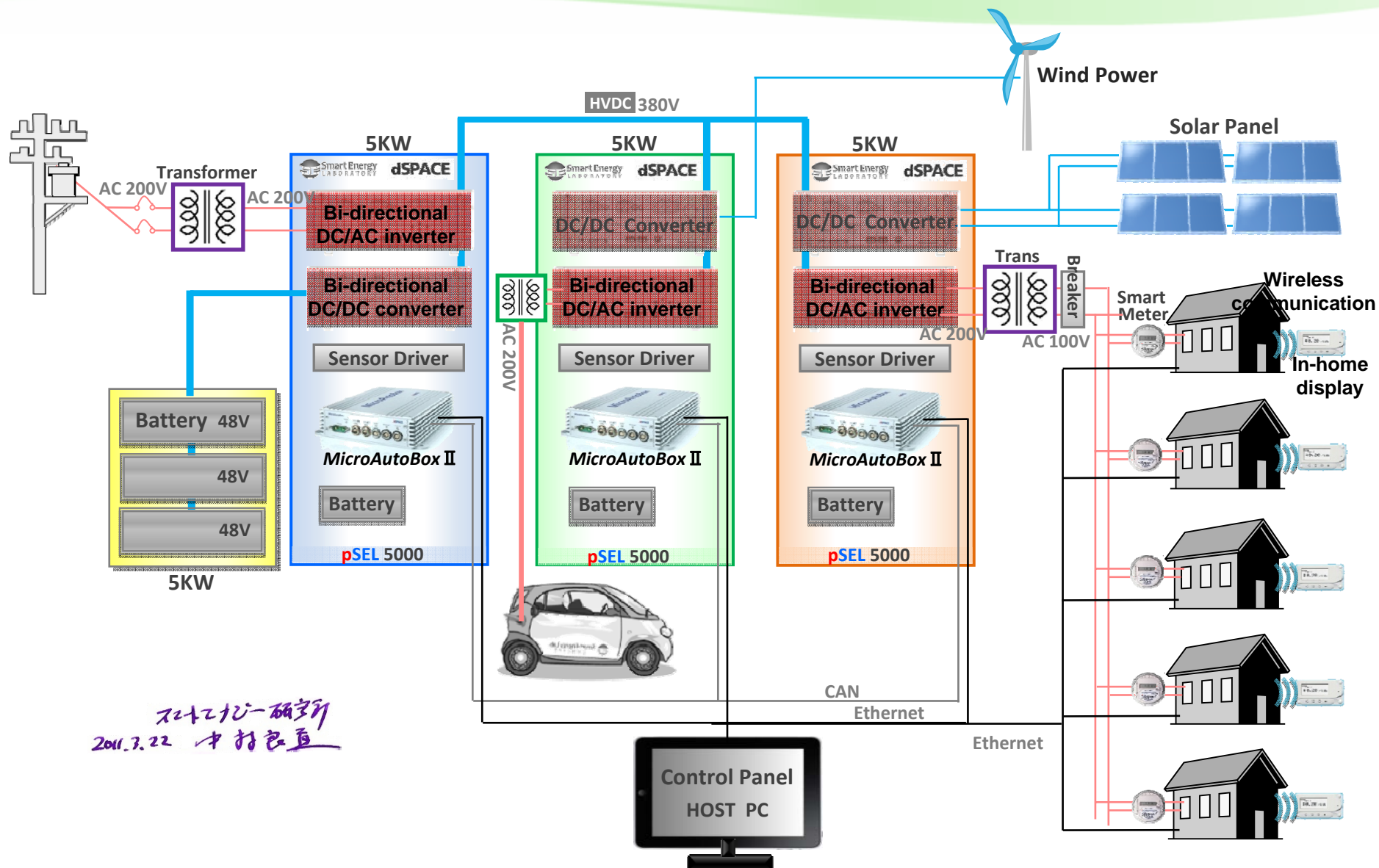
- Real time control strategy using Model based design

The power supply can be changed according to the quantity of solar radiation.

Detection of best point (MPPT) of electric power

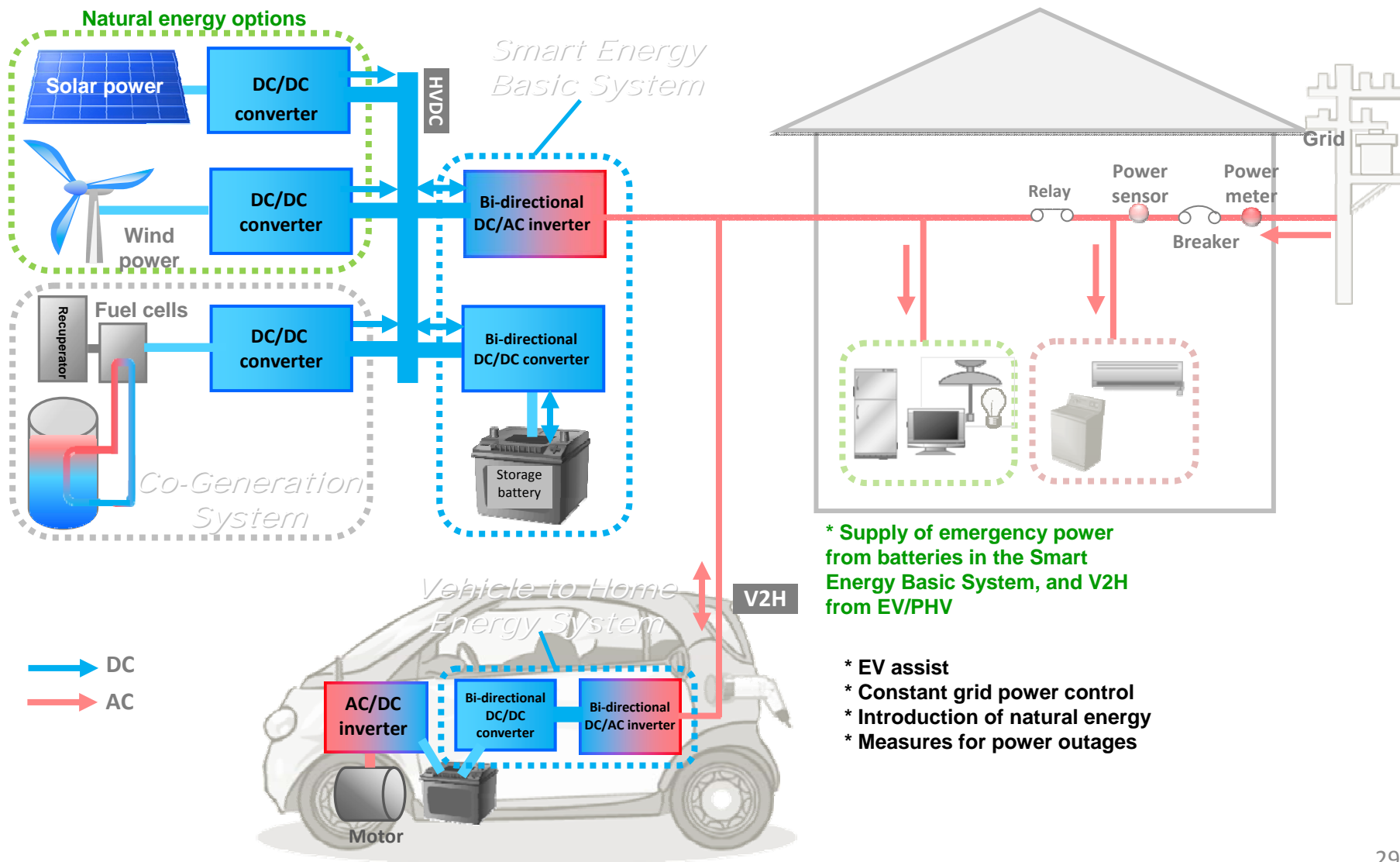


Smart Community Energy System (prototype)



Smart House System 2011

Renewable Energy Options



Agenda

- Based on the results of the Fukuoka Smart House Consortium
- What is the Yokohama Smart Community?
- Creating secure and plentiful future communities

Creating Secure and Plentiful Communities for the Future

- * Creating a community model to cultivate art, culture, and nature for a secure and plentiful future. In practice, this encompasses building and verification of a community of multiple houses. The question arises as to how best can science and technology contribute to society within this context.
- * The secret to a truly plentiful lifestyle is not the solution of technical problems, but rather, an understanding the nature of the society we desire, and a lifestyle in harmony with nature which does not impose a burden on the natural environment. The definition of a plentiful lifestyle, and how it will reveal itself in the future, also require consideration.
- * The skilled use of natural energy allows the building of a low-cost and flexible energy system, and is also associated with CO2 reduction and solutions to food shortages.
- * The question of how best to use grid power supplies and natural energy effectively to ensure optimum use of energy within the home, and whether electric vehicles are able to be charged, requires research and verification of optimum control relative to the weather forecast and family life. A mechanism is necessary which integrates the each house and the community. Experimentation to ensure the ability to accommodate the diverse cultures and lifestyles of Yokohama.

Creating Secure and Plentiful Communities for the Future

- * Research and demonstration (consideration of local production and consumption systems, for example, consumption of energy in plant cultivation, bread manufacture) related to food and a recycling society using low-cost energy (e.g. natural energy).
- * Provide opportunities for demonstrations by energy-related businesses. Enable experiments with energy devices, testing of energy-efficient home appliances, and testing of double glazing performance etc. Introduction of a testing environment using advanced technology (e.g. mathematical models, simulators) to facilitate participation by local businesses, and its use as business infrastructure.
- * Facilitate tours by a wide range of age groups, from school children to the elderly, to enhance the attractiveness of the Yokohama Smart Community as a model for the future.
- * Seek participation by organizations and businesses in agreement with the Yokohama Smart Community concept. Undertake activities to secure participation and knowledge from a wide range of fields including the environment, energy equipment, construction, home appliances, transport equipment, the arts, and culture.
- * Hold periodic seminars to disseminate, both locally and overseas, results obtained from the work of the Yokohama Smart Community. Use this model on a regional basis to expand scope.

Learning From Nature and Biology – Barcelona's Parc Guell



- Parc Guell is one of a collection of Gaudi's works. Designated as a UNESCO World Heritage Site in 1984.
- Count Guell commissioned Gaudi to build a garden-residential site without limits or restrictions. The result was an integrated work of art, in harmony with nature.
- Built between 1900 and 1914, in an age of advancing industrial development in Barcelona, Gaudi and Count Guell used the site to create a new residential area in which life was conducted surrounded by nature and art.

Source:

<http://ja.wikipedia.org/wiki/%E3%82%B0%E3%82%A8%E3%83%AB%E5%85%AC%E5%9C%92>

Learning From Art and Nature - Naoshima in Kagawa Prefecture



- Naoshima, an island in Kagawa Prefecture in the Inland sea. Since 1980, the Benesse Corporation has been engaged in a project on the island to integrate the island itself with life and art as the Benesse Art Site.
- Soichiro Fukutake, Managing Director and President of Benesse Holdings, opened a training institute and camp site under a master plan developed by Tadao Ando. The plan is referred to as the 'Naoshima Cultural Village Concept', and is dedicated to creating an area in the south of the island for the cultivation of 'people and arts'.
- In addition to a number of art museums, the island itself is a museum of modern art (the Standard Exhibition). The old houses in the main village on the island have been purchased and restored and recycled in a project to develop a modern art installation permanent display site.

Benesse Art Site, Naoshima

<http://www.benesse-artsite.jp/>

Memories from Yokohama - Trade

- A History of Rail, Port, and Silk

In 1859 the Port of Yokohama was opened to the world. Numbers of foreign ships began arriving, many foreign merchants built houses in the new enclave, and Japanese trading companies were also established. The port of Yokohama's trade developed greatly through these trading companies. From the opening of the port and up to the start of the Showa era in the mid 1920's, most the trade exports were raw silk, which was carried to Yokohama by road or river. In 1909, Japan surpassed China as the world's leading exporter of raw silk. Japan's sericulture industry supported Japan's economy and contributed significantly to the country's modernization. Foreign culture fanned out all over Japan from the silk center of Yokohama.



Hikawa Maru: Completed in 1930 and sailed on her maiden voyage to Seattle in the same year. This was one of Japan's most luxurious liners. Former passengers include Charlie Chaplin and Prince and Princess Chichibu Nomiya. The ship has become a Yokohama City-designated tangible cultural asset that still attracts numbers of people who come to admire its gracious lines.

Source: <http://www.city.yokohama.lg.jp/kowan/m-learn/history0.html>
<http://www.silkmuseum.or.jp/main/index.html>
<http://www.timeslip-y.jp/index.html>

Yokohama's Culture - The Arts

For Yokohama to achieve autonomous development as a city, as it goes into the future it is essential that Yokohama create and communicate new value and appeal. Accordingly, the city has proposed the *Culture and Arts Creative City: Creative City Yokohama* initiative, the central pillar of its new urban development concept.

This is a new city vision to create intangible cultural aspects and a tangible Yokohama-type urban space based on economic development.

— **Yokohama Museum of Art** <http://www.yaf.or.jp/yma/index.php>

Inaugurated in March 1989 as a part of the Yokohama Exposition, it was opened on November 3 of the same year. This museum was established under a basic vision of connections between *seeing*, *making*, and *learning*. Its wide-ranging collection includes mainly works from the second half of the 19th century by artists like Salvador Dali, Rene Magritte, Joan Miro, Pablo Picasso, and Paul Cezanne, as well as works by artists with a close connection to Yokohama from the end of the Edo period and post-Meiji era. It also houses an extensive collection of photographs.



Cho Minsuk and Joseph Grima with Storefront Team 《Ring Dome》 2008

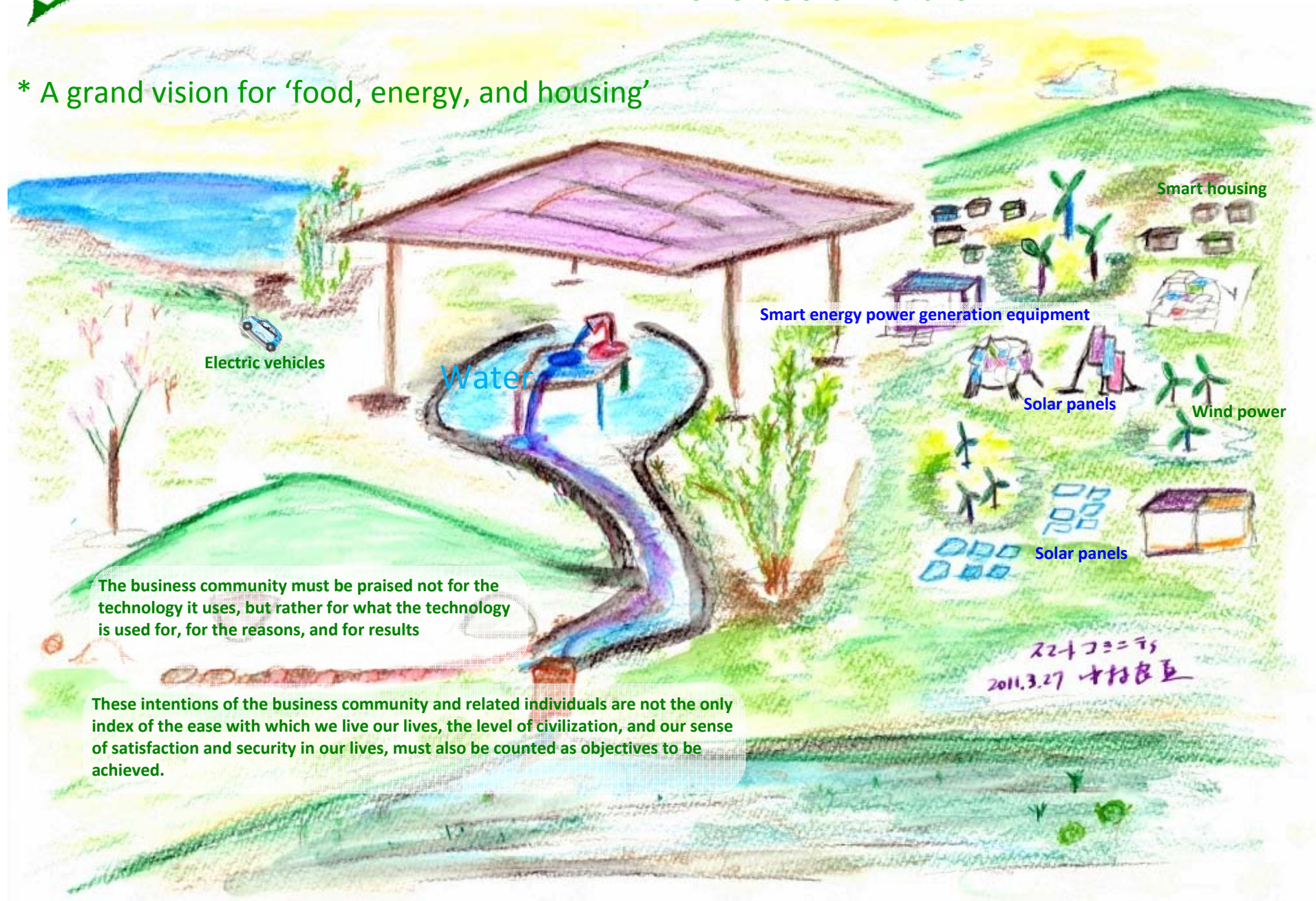
— **Yokohama Triennale**

This is an international exhibition showing off one of Japan's largest collections of contemporary art. Started in 2001, it is a major international art exhibition held once every three years. Based on an overall theme proposed by the Triennale director general, the exhibition displays leading-edge contemporary artworks, including images, installations, photographs, paintings, and sculptures under one roof.

Source: Yokohama 100 Questions 2009 (Collection of reference questions for candidates for Kanagawa certification and Yokohama licensing examinations, Kanagawa Shimbun, 2009)

The Smart Community grand vision – learn from nature, make use of nature

* A grand vision for ‘food, energy, and housing’



What Points Can We Learn From Biosystems?

What are the points for creating and verifying energy systems?

- There should be energy channels with two-way energy exchange functions
 - Energy and information should be linked and be able to react autonomously
 - Internal operation and the external environment should be made *visible* and there should be a verifiable development environment (a model-based development environment by dSPACE)
- An eco-system is a system where chemical energy and information are fused at the highest level. Similarly, smart energy systems also fuse energy and information. Accordingly, to make smart energy systems popular, it will be necessary to create power units that can evolve in the same way as life and permit the sort of evolution seen in multi-cellularization and diversification.

Smart Energy Laboratory CTO and Founder Yoshimichi Nakamura

Thank you very much for your attention

The Yokohama Smart Project is not only the result of energies based on science and technology, but also requires the power of the natural environment that keeps us healthy. It is necessary to learn from plants and other living things and to think in new ways about fusing elements. To achieve this, we cannot leave out the power of culture and the arts and intend to link these to the future.

With participants from a wide range of fields in Japan and around the world, we need to make this a project that asks the question: “What actually is a community that links generations together as it goes into the future?” I am very happy that this community has been started in Yokohama and hope it receives participation and support from all fields.

Hitoshi Arima, Representative, Yokohama Smart Community

Schedule and Contact Details

- Website <http://ysc.paltek.co.jp>
- Schedule
 - The Yokohama Smart Community will be introduced “Yokohama Smart City Project (YSCP) Forum (Tentative)” which scheduled July 15th (Fri). (Host: Yokohama City, YSCP Promotion Association)
 - Preparations for demonstration and testing in August
 - Seminars scheduled twice yearly
- Inquires related to the Yokohama Smart Community

Secretariat		Refer to PALTEK
Executive officer	:	Daisuke Maekawa
Proxy officer	:	Junichi Emoto
Coordinator	:	Emiko Kenjo
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