A project sponsored by MIC in Goto islands, Nagasaki
- Studying communication protocol necessary for smart-grid and V2G -

Takahiro SUZUKI
Director General (EV&ITS Promotion)
Industry and Labor Department
Nagasaki Prefectural Government

2010.7.8
Nagasaki EV&ITS Project
Goto islands, Nagasaki

- "Nagasaki EV&PHV Town Master Plan"
  - The only one to the west of Kyoto in 8 EV・PHV towns selected by the Government.
- "Revitalization of isolated islands"
  - Job and industry creation is necessary to solve the problem of decreasing population in islands, which occupies 40% of Nagasaki.
- Action for registration to the World Heritage
  - "Churches and Christian Sites in Nagasaki" are registered to the candidates list in Jan, 2007. Environmental protection efforts are important to the future formal registration.
- "Electrically Connected islands"
  - Increasing of electric demand in isolated island does not always mean "eco".

The longest underwater electric cable in Japan connects Goto and mainland. (53km)

Goto islands

Population: 67,046
Households: 31,375
Gross area: 634.78 km²
No. of Cars: 39,334

Nagasaki Prefecture

- Composed of mainland (incl. Nagasaki city) and 3 major island areas of Iki, Tsushima, and Goto islands (Goto city & Shin Kami-Goto town).
  - Population: 1,458,404
  - Households: 607,465
  - Gross area: 4,104.48 km²
  - No. of Cars: 891,544

※ Total coastlines is 4,196 km is the longest in Japan (12%). (excluding Northern Territories)
<Project Targets>
- Implementation of “Practical Introduction and Operation of EVs and ITS Tourism” and “Model Demonstration of Connecting Energy Grid and EVs” based on the discussions by Nagasaki EV&ITS Consortium.
- Creation of “Nagasaki’s Global Standard” and “Nagasaki’s Regional Business Model” through promoting collaboration of local industries and universities.

☆ Introduction and Operation of EVs and ITS Tourism

Electric vehicles (mainly for rent-a-cars) and chargers are introduced in 2009-2010 periods.

- **100 EVs** with ITS on-board units are introduced in Goto islands and used mainly for rent-a-car.
- **Quick Chargers**: 4 units at 2 sites (March, 2010) + 11 units at 6 sites (June, 2010).
- Delivering local sight-seeing information by ITS tools → **10 recommended routes** for each islands are installed.

Development to the other uses for EVs (Ex. taxis) and to the other areas after 2010, based on the model clarified from the experiences in Goto.

※Results of rent-a-car use

585 cars by 19 agents (until June 4, 2010)
(Goto city: 488 cars by 12 agents / Shin Kami-Goto town: 97 cars by 7 agents)
Nagasaki EV&ITS Project: Image of “Advanced ITS Tourism”

Targets: Implementation of EV and ITS Tourism, Demonstration of Smart Community, Creation of “Glocal” Standard Model

3. Providing Real-Time Information using ITS Technologies

Choose various optional tours provided as real-time information and guided to the site by car-navigation system!

Plentiful experiences of local specialties

Advanced ITS Tourism

1. Smooth Connection of Public Transportation and EV Rent-A-Car

Smoothly to Goto!

To a clean travel around world heritage churches...

Comfortable trip with eco & silent EV!

2. Infrastructure Installation: Chargers and ITS Services

ITS on-board units navigates recommended routes, and guides attracting spots, local souvenirs and events.

Charging during sightseeing!

Food

Smart Payments

Rent a car

Parking

4. Smooth Toll Collection by ITS on-board unit

Souvenir

Hotel
Aims: <Practical installation and operation of EVs and ITS tourism>, <Conducting project with creating global rules and standards from region>, <Promoting regional industries led by sightseeing and ecology>, <Demonstration of connecting energy grid and EV>, etc.

New consortium and WG members are always welcome!!

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## Establishment of Consortium 2009.10.8

### Car Makers
- Isuzu
- Toyota
- Nissan
- Subaru
- Mitsubishi Motors

### E&E, Navi Makers
- Aisin AW
- Alpine
- Oki Electric
- Clarion
- Denso Kyushu
- Toyota Shokki
- Toyota Tsusho Electronics
- NEC
- Pioneer
- Panasonic Solutions Japan
- Hitachi
- Fujitsu
- Mitsubishi Electric

### Local Companies & Groups
- IT space
- IRODORI Kobo
- OUGISEIKO
- Kameyama Electric
- Kawakami Kesenstu-Kogyo
- Kyowakiden Industry
- KB Software
- Goto Wind Power
- Goto Shokokai
- SAII Information Service
- Sasebo Heavy Industries
- SEA ALL
- System5
- G.S. Eletech. Kyushu
- Superware Inc.
- Choryo Control System
- Nagasaki Ecology & Energy Industry Network
- Nagasaki Pref. Convention & Visitors Bureau
- Foundation of Encourage Nagasaki Industry
- Nagasaki Pref. Automotive Industry Promotion Association
- Federation of Commerce & Industry in Nagasaki Pref.
- Federation of Shokokai in Nagasaki
- Nagasaki IT Solution Industry Association
- Nagasaki Pref. Taxi Association
- Nagasaki Chuokai
- Nagasaki Rent-a-car Association
- Nishikyusu Enbedded Technology Community
- Nishi-Sonogi Shokokai
- PAL Corporation
- HOP Co., Ltd.
- MHI Nagasaki Shipyard & Machinery Works
- Miyabi Sekkei
- Yamada Denki Kogyo

### IT, Infrastructure Companies
- ANA Strategic Research Institute
- NTT Data
- NTT Data Customer Service
- MEC
- Oriental Consultants
- KDDI
- Kyuki
- Kyushu Electric Power
- Contents City
- CBC
- Shimizu Corporation
- Shindengen Electric Manufacturing
- JTB
- Sumitomo Electric Industries
- SEGWAY Japan
- ZENRIN Datacom
- Chodai
dSPACE Japan
- TEPCO R&D Center Mobility Tech. Group
- Nishiteitsu Information System
- Nishimu Electronics
- Nichicon
- Nippon Koei
- Nihon UNYSIS
- Park24
- Hakuhodo
- Pacific Consultants
- PATLITE
- Fukken Co., Ltd.
- Mitsui & Co., Ltd.

### Academies & Associations
- ITS Service Promotion Association ORG. (ISPA)
- ITS Japan
- Internet ITS Consortium
- Keio Univ.
- Sasebo National College of Technology
- KEITA
- ITS Center, IIS, Univ. of Tokyo
- Kyushu Economic Research Center
- Organization for Road System Enhancement
- Highway Industry Development Organization (HIDO)
- Nagasaki Univ.
- Univ. of Nagasaki
- Nagasaki Institute of Applied Science
- JARI

### Cities and Towns

### Observers (Govs, Prefs, City)
- Ministry of Economy, Trade and Industry
- Ministry of Land, Infrastructure, Transport and Tourism
- Japan Tourism Agency
- National Institute for Land and Infrastructure Management
- MOE, Kyushu Regional Environment Office
- Kanagawa Pref.
- Aichi Pref.
- Kyoto Pref.
- Kyoto City

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① EV for private use → Charging EVs during parking at port (when drivers are going to mainland)
② Power supply from solar cells is not constant: vary by weather and daylight
③ Utilize Li-ion batteries on parked EVs and PHVs as micro-grid cells
④ Need negotiation with various relating laws and regulations
1. Target
   Development of infrastructure as charging spots for EV promotion

2. Plan (unfixed)
   Supply electric power to parked EVs and port terminal demands produced by solar cells installed on Fukue port.
   (Area: 1.5ha, System capacity: about 2MW, Year total: 1,818 MWh)

Solar Power Supply Level corresponding to:
- ★ 237 EVs (per day)
- ★ 3.8 times of total electric consumption (for lighting) in Fukue Port Terminal

Merit
- ★ Residents in Goto can charge EVs while parking at port terminal.
- ★ Education & dissemination to citizens and visitors by PR facilities enlarges numbers of visitors.
“Field test for studying communication protocol in Goto Islands, Nagasaki”

Project Manager
Keio University
Associate Professor Hiroaki Nishi
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<td>3. Project Overview</td>
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## 1. Ministry of Internal Affairs and Communications (MIC) Public Fund Overview

| Title | MIC FY2010 the second supplementary budget  
[(MIC Website) http://www.soumu.go.jp/menu_news/s-news/02tsushin04_000017.html] |
<table>
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<th></th>
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<tbody>
<tr>
<td>Summary</td>
<td>To accomplish a reduction of environmental impacts, the standardization of technical standard is promoted, which is linked to “Network control system”. Network control system collects various information from many equipments connected to the network, and the system integrates these equipments with the information for achieving an effective control.</td>
</tr>
<tr>
<td>Our Proposal</td>
<td>This project focuses to develop the network communication system by covering and integrating the current various technical standards including communication network, communication QoS, security, information home appliance, EV/ITS, smart grid, etc. Fukue port terminal, Goto city, Nagasaki prefecture is selected as a testing field of this system because the city consists of typical isolated islands and 100 EVs are introduced.</td>
</tr>
<tr>
<td>Location</td>
<td>Fukue port terminal, Goto islands, Nagasaki Prefecture</td>
</tr>
<tr>
<td>Project Term</td>
<td>From July 2010 To March 2011[Field test at Fukue port: From January 2011 to February 2011]</td>
</tr>
<tr>
<td>Focuses of Project</td>
<td></td>
</tr>
</tbody>
</table>
- Collection, management, exploitation of resource information and environmental information  
  - Actual data of the electric power consumption or power generation  
  - Integration of an amenity index by using environmental sensors and power consumption control  
- Practical field test  
  - Implements an actual system and evaluates the communication protocols, data schemers, etc.  
- Preliminary standardization |
| Focuses of Study |  
1. Providing the preliminary standard of the information infrastructure  
2. ICT environment at an individual location  
3. Verification of CO2 emission reduction |
2. Requirement for Smart Community from the viewpoint of ICT environment

<table>
<thead>
<tr>
<th>Supply Side</th>
<th>Demand Side</th>
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<tr>
<td>Wind Power Generator</td>
<td>Middle/small buildings</td>
</tr>
<tr>
<td>Photovoltaic Power Generator</td>
<td>Taller buildings</td>
</tr>
<tr>
<td>Thermal Power Generator</td>
<td>Smart House</td>
</tr>
<tr>
<td>Electric Power Company</td>
<td>Charging Station Network</td>
</tr>
<tr>
<td>Substation</td>
<td>Smart Grid Control Center</td>
</tr>
<tr>
<td>Transmission Grid</td>
<td>(1) Smart Grid Control Center</td>
</tr>
<tr>
<td>Battery</td>
<td>(3) Middle/small buildings</td>
</tr>
</tbody>
</table>

5 areas to attain Smart Community

1. Demand/Supply control: Demand/Supply forecast, Supply control, Demand allocation
2. Supply Forecast/Control: Supply forecast of Photovoltaic/Wind power generator
3. Demand Forecast/Control: Smart metering
4. Demand Response: Demand control to Smart houses and Smart buildings
5. EV Demand Forecast/Control: Demand Forecast/Control of charging infrastructure and EV parking space
2. Requirement for EV and its charging station from the viewpoint of ICT environment

1. Operational viewpoint: Individual environment and structure are established to attain user convenience and safety or to improve an operation efficiency, respectively.

2. Smart Grid viewpoint: On the bases of the concept “EV as a energy resource”, EV charging demand is controlled and integrated with Smart Community (V2G).

- **Mobile/PC**
  - Visualize the status of EV (EV status, EV location, charging status etc)
  - Visualize the status of EV charging station (EV charging status, error, location)
  - Show the nearest or desirable EV charging station
  - Receive an e-mail from Center

- **Car navigation**
  - Visualize probed information from EV charging station
  - Show the nearest or desirable EV charging station (EV charging status, error, location)
  - EV data (probed information, etc)

- **ITS center**
  - Collect the status of EVs and information from the concerning Smart Community
  - Provide the information of the nearest or desirable EV charging station to car navigation systems
  - Location of EV charging station
  - EV data (location, battery, etc)

- **EV (battery) monitoring**
  - Collect EV probe information (Data of running condition, battery condition etc.)

- **EV charging station**
  - User authentication (with smart card, with EV itself)
  - Collect EV charging station info. (User information, Amount of electric power used, error detection)

- **EV charging station management center**
  - User management, authentication
  - Management of information from EV charging station (User info., Amount of electric power used, error detection, charging status, reservation)
  - EV battery demand control/forecast

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3. Project Overview - Necessity of Standardization of Information Exchange in a Smart Grid Area

- Various and enormous amount of information needs to be controlled according to an unified rule for attaining Smart Grid.
- The project focuses on the preliminary standard of the information infrastructure for fulfilling requirements of X-to-Grid(X2G)

**Requirements for Smart Grid Network**

- **Secure**
  - Anti-attack, dependability
- **High Quality**
  - To guarantee RASIS
- **Neutrality**
  - Technical neutrality
- **Flexibility**
  - Scalability, Co-existence
- **Uniformity**
  - Unity of command

**Adaptation of existing standards (NIST, IEEE P2030, etc.)**
This project focuses on the preliminary standard of the information infrastructure, including “Meta-Standard” and X2G (V2G, B2G, H2G, etc.). “Meta-Standard” enables to provide an easy method for designing a service or an application to evolve.
This project aims to develop an ICT environment for controlling various resources of a community intensively. Various data from both supply/demand side are collected and stored into the Resource Management Center and is used for effective system controls. Preliminary standard of this kind of network system is also discussed.

**Community Resource Management Network**

**Supply Side**
- Collection of resource information and environmental information
- Evaluation of the method for collecting these information.
- Evaluation by using a simulator

**Resource Management Center**
- Information management by a central resource management server
- Providing the preliminary standard of the information infrastructure
- Verification of CO2 emission reduction

**Demand Side**
- Collection of resource information and environmental information of demand side
- Evaluation of the method for collecting these information.
- Evaluation of resource information of mobility

**Middle/small buildings**
- (Fukue port terminal)

**Mobility**
- (Goto Islands)

**Common Platfor**
- Smart Community Infrastructure
- Mobility Infrastructure
- Resource Database
- Resource information
- User information
- Application

**Network**
- NW Monitoring
- Communication Management

**Requirement for smart community ICT environment**
- Secure
  - Anti-attack, dependability
- High Quality
  - To guarantee RASIS
- Neutrality
  - Technical neutrality
- Flexibility
  - Scalability, Co-existence
- Uniformity
  - Unity of command

**Technology standard** (NIST, IEEE P2030 etc)
3. Project Overview - Reference to Nagasaki EV&ITS_1 SC

The project collects the actual data from magenta covered area and study how the data is made use of. (The dotted area is run by simulation)

Supply Side

Demand Side

5 areas to attain Smart Community

1. Demand/Supply control: Demand/Supply forecast, Supply control, Demand allocation
2. Supply Forecast/Control: Supply forecast of Photovoltaic/Wind power generator
3. Demand Forecast/Control: Smart metering
4. Demand Response: Demand control to Smart houses and Smart buildings
5. EV Demand Forecast/Control: Demand Forecast/Control of charging infrastructure and EV parking space
3. Project Overview - Reference to Nagasaki EV&ITS_2 EV/Charging Station

The project collects the actual data from magenta-covered area and study how the data is made use of.

1. Operational viewpoint: Individual environment and structure are established to attain user convenience and safety or to improve an operation efficiency, respectively.

2. Smart Grid viewpoint: On the bases of the concept “EV as a energy resource”, EV charging demand is controlled and integrated with Smart Community (V2G).

**Mobile/PC**
- Visualize the status of EV (EV status, EV location, charging status etc)
- Visualize the status of EV charging station (EV charging status, error, location)
- Show the nearest or desirable EV charging station
- Receive an e-mail from Center

**Car navigation**
- Visualize probed information from EV charging station
- Show the nearest or desirable EV charging station (EV charging status, error, location)
- EV data (probe information, etc)

**ITS center**
- Collect the status of EVs and information from the concerning Smart Community
- Provide the information of the nearest or desirable EV charging station to car navigation systems
- EV data (probe information)
- Demand response: EV data (location, battery, etc)
- Electric power consumption

**EV (battery) monitoring**
- Collect EV probe information (Data of running condition, battery condition etc.)

**EV charging station**
- User authentication (with smart card, with EV itself)
- Collect EV charging station info. (User information, Amount of electric power used, error detection)
- Authentication
- Charging completion
- Location of EV charging station
- Electric power consumption

**EV charging station management center**
- User management, authentication
- Management of information from EV charging station (User info., Amount of electric power used, error detection, charging status, reservation)
- EV battery demand control/forecast

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3. Project Overview — Organization

Project Organization

General director: Keio University President Atsushi Seike

Project Manager: Keio University Associate Professor Hiroaki Nishi

PMO (Project Management Office)
- Keio University
  - Associate Professor Hiroaki Nishi
  - Professor Katsuhiko Ogawa
  - Associate Professor Keisuke Uehara
  - Research Associate Ryogo Kubo
  - Emeritus Professor Hironao Kawashima
  - Professor Jyun Oota
  - Research Affiliate Toshio Togoshi
  - Keio University Secretariat
- NTT DATA CORPORATION
- Hitachi Information & Communication Engineering, Ltd. (Hitachi JTE)

Nagasaki EV&ITS consortium
Nagasaki Prefectural Government
Goto Islands council

Cooperation

Fixing of the scope of standardization
Definition of communication data format (XML)
Definition of communication common platform

Project Members
- Hitachi JTE
- dSPACE Japan
- KDDI
- Seiko Instruments Inc.
- Panasonic Electric Works
- MITSUBISHI HEAVY INDUSTRIES, LTD
- NTT DATA CORPORATION

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### 3. Field Test Overview — Project Schedule

Field test is running according to the following schedule.

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<th>Field Test</th>
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<th>CY2011</th>
</tr>
</thead>
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<td>Apr-Jun</td>
<td>Jul</td>
</tr>
<tr>
<td>Project Kickoff/Planning</td>
<td>System Development/System Test at Tokyo</td>
<td>Real System Implementation/Test at Fukue port</td>
</tr>
<tr>
<td>Field Test Setup</td>
<td>▲9-Apr Proposal</td>
<td>▲4-Jun Adoption</td>
</tr>
<tr>
<td></td>
<td>▲Beginning of development</td>
<td></td>
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</tbody>
</table>