HUMAN CENTRIC SMART COMMUNITY FOR HIGH-QUALITY AND SUSTAINABLE LIFE

Toyota City Field Test Project for Low Carbon Society System

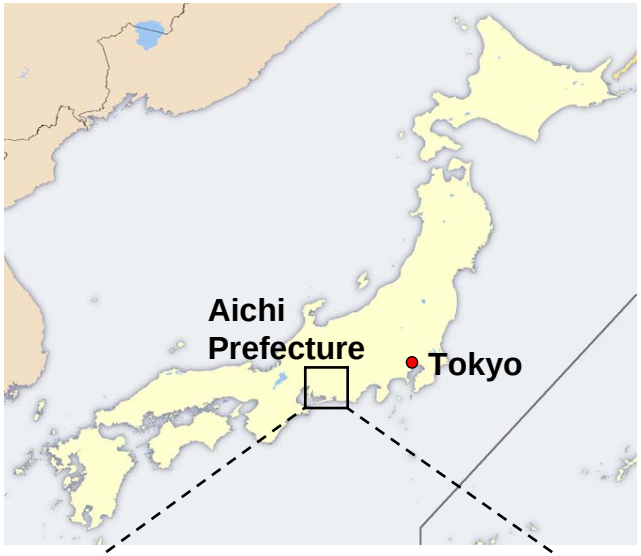
November 3, 2010

TOYOTA MOTOR CORPORATION
Dream Incubator, Inc.

ABOUT TOYOTA CITY

Overview

Location:	**Mikawa region of Aichi Pref. (East of Nagoya city)**
Total Area:	**918.47km^2 (30% bigger than Singapore)**
Total Population:	**423,822**
Industry:	
Major employer	**Toyota Motor Corp.**
# of factories	**1,345**
# of factory workers	**108,940**
Shipment value of mfd. goods	**13 Trillion JPY* (=160B USD**)**



The city is deeply related to Toyota Motor Corporation

* Highest in Japan since 2002
** About the same amount of GDP of Chile or Philippine

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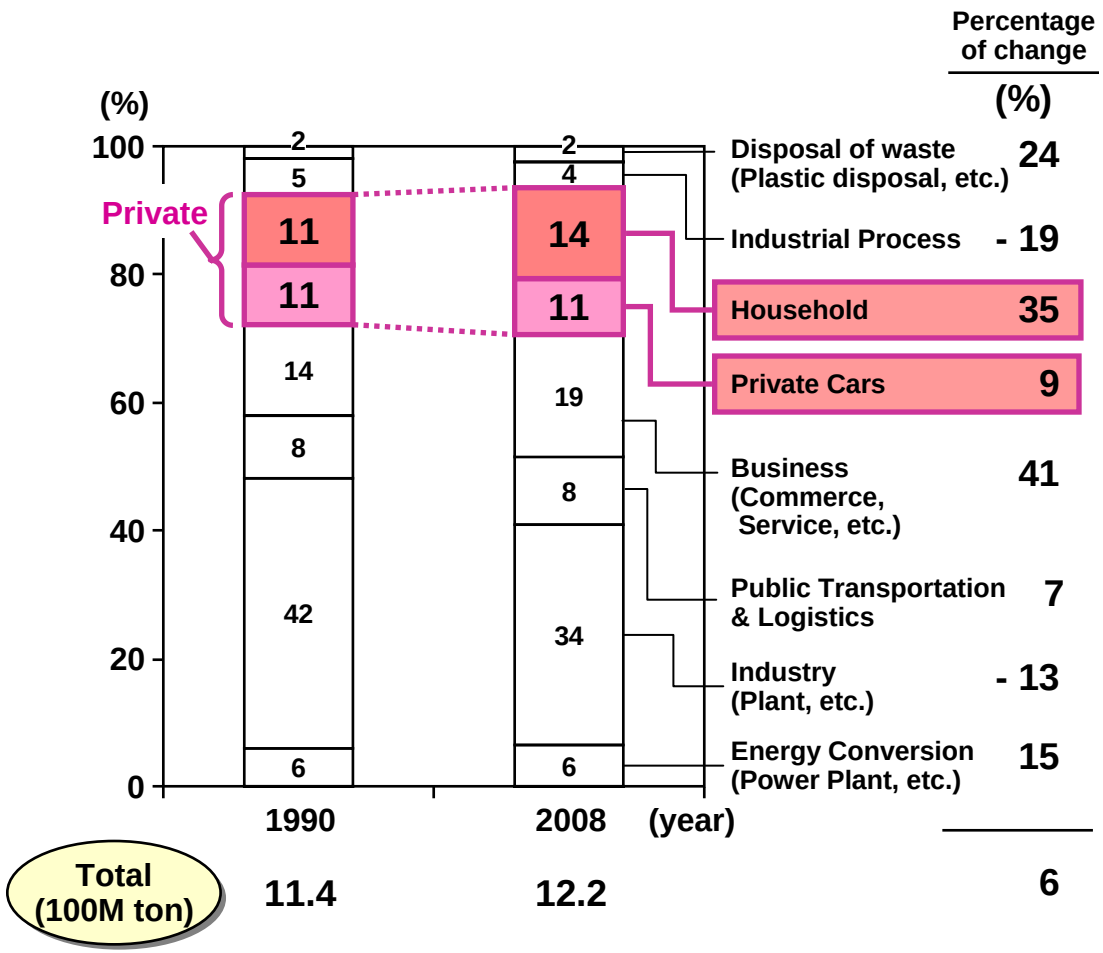
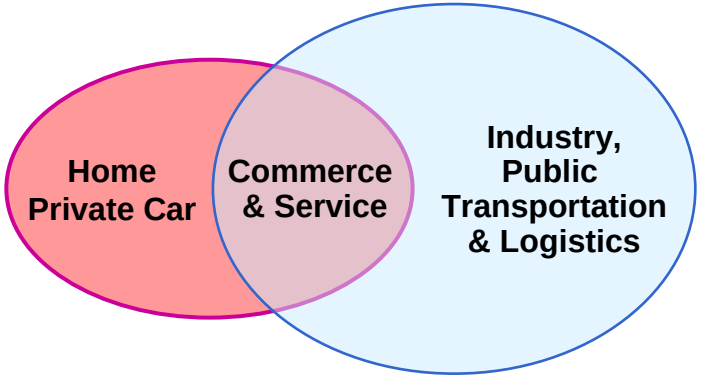
BASIC POLICY OF OUR FIELD TEST: FOCUS ON PRIVATE SECTOR

Sector share of CO_2 emission (Japan)



Trend of CO_2 emission



"Private Sector" "Industrial Sector"

Increasing ⟷ Decreasing

Challenges of focusing on private sector

- "Ecological life without endurance"
- "Respect for individual sense of values and individual eco life style"

"Human centric" is important

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CONCEPT OF TOYOTA CITY FIELD TEST FOR LOW CARBON SOCIETY

Focus Points/Challenges

<1> Focus on household (consumer)	<2> Restraint of social cost	<3> Global competitiveness
• CO_2 emission is high and increasing in this sector. • Each generation source of CO_2 emission is small but widely spread.	• Voluntary installation of green devices by individual family alone has limited impacts on CO_2 reduction • Expensive system will not become a worldwide solution for green society.	• Next generation energy system industry creates huge worldwide markets supported by several social needs on a global scale. • Global competitiveness is important key factor.

Direction/Approach

Field Test design along the flow of people's life

- Optimization of energy use in a household and pubic area such as shopping districts.
- Develop the Low carbon transportation systems which cover daily scenes of work and shopping.

Energy management in entire community

- Optimization of entire energy use in a community.

Fostering changes to greener life style

- Lead people to low carbon life style with high QOL, without any endurance for people and any expensive cost for society.

Open policy of the field test

- Work hard together with global representatives.

Ensure global deployment

- Actively challenge to the worldwide issues. (sometimes it is not issue in Japan at all)
- Global standardization study along with global organizations.

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FIELD TEST CONSISTS OF 4 MODULES ALONG THE FLOW OF PEOPLE'S LIFE

Flow of People's Life

Household	Transportation	Public places	Total living space
1) Optimization of home energy use	2) Low Carbon Transportation systems	3) Optimization of energy use in public space	4) Motivate green life style to optimize total energy use

Project Management

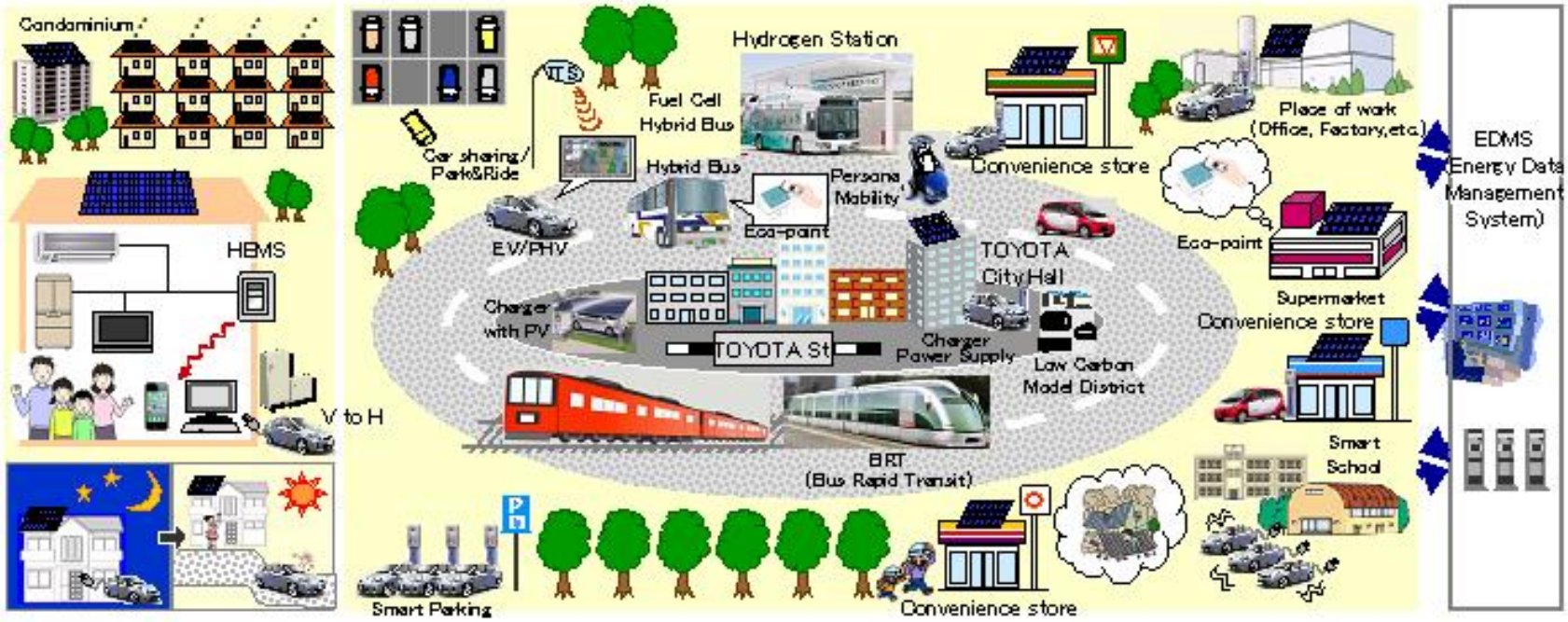
Toyota City, TOYOTA, CHUBU Electric Power, DI (Dream Incubator Inc.)

Project Members

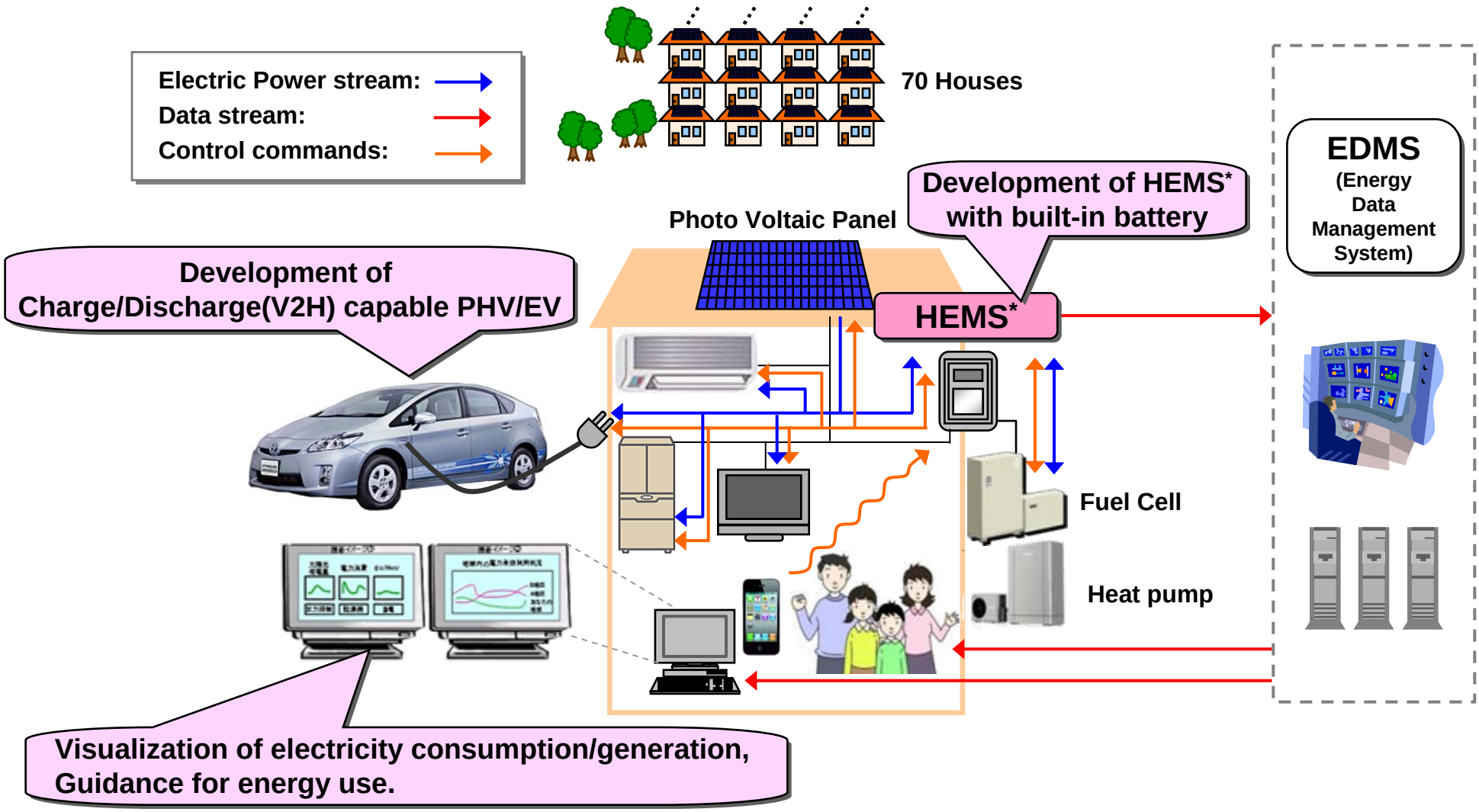
(Total 20 organizations)

- Household: DENSO, CHUBU Electric Power, TOHO GAS, TOYOTA HOME, トヨタすまいるライフ株式会社, TOYOTA, KDDI, SHARP, YAZAKI, TOYOTA
- Transportation: Toyota City, TOYOTA, KDDI, TOYOTA TSUSHO CORPORATION, Mitsubishi Corporation, MEITETSU, TOHO GAS, TOYOTA
- Public places: MITSUBISHI HEAVY INDUSTRIES, LTD., DENSO, TOYOTA, TOYOTA TSUSHO CORPORATION, Toyota City, TOYOTA, Mitsubishi Corporation, TOHO GAS
- Total living space: TOYOTA, Toyota City, DI, TOSHIBA, FUJITSU, KDDI, CHUBU Electric Power, Mitsubishi Corporation, TOYOTA HOME, トヨタすまいるライフ株式会社, TOHO GAS

Field Test Items



1) OPTIMIZATION OF HOME ENERGY USE



Maximum use of PV energy with optimum HEMS control

* Home Energy Management System

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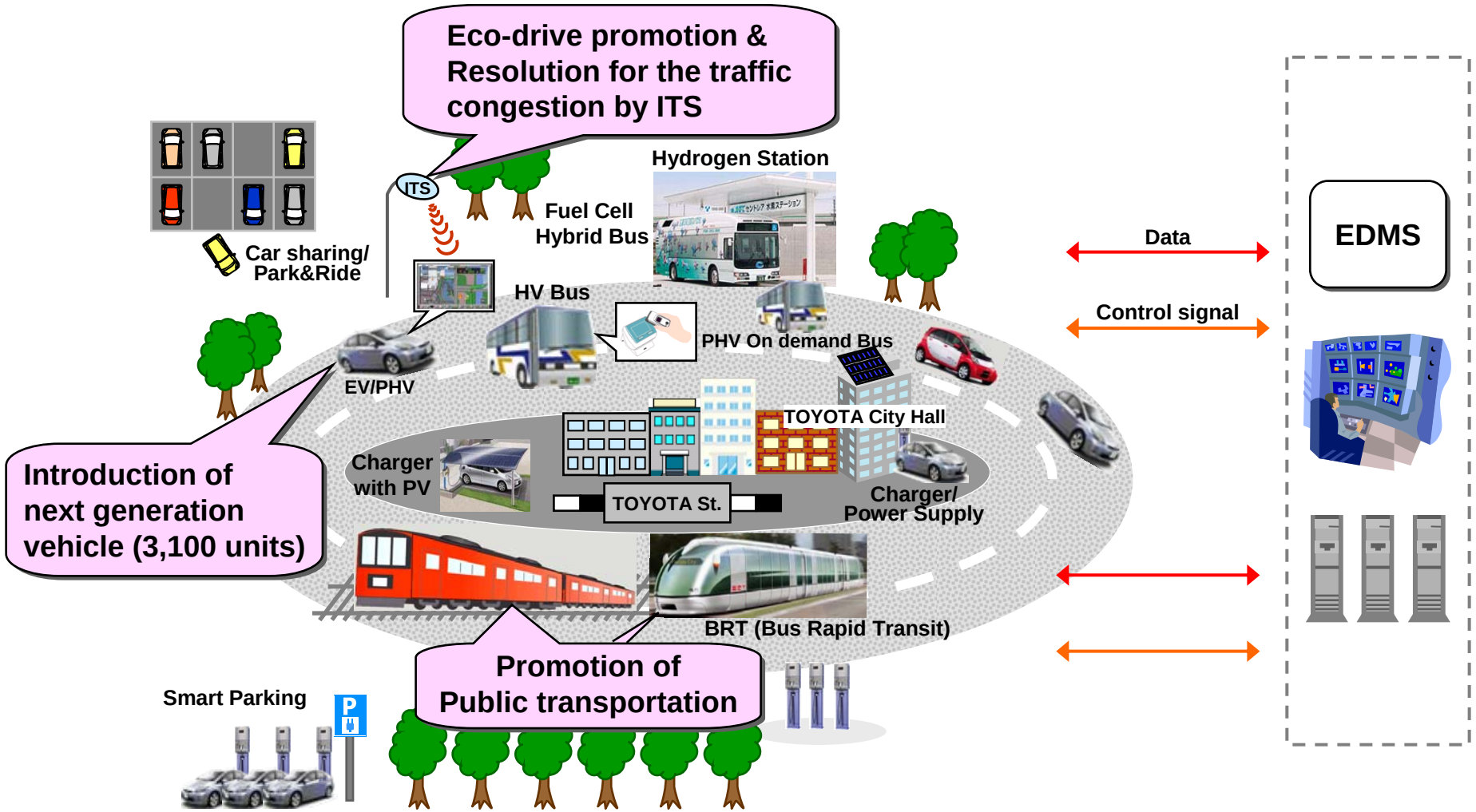
2) LOW CARBON TRANSPORTATION SYSTEMS



Effective use of various transportation systems will contribute to "Green community" in terms of human movement

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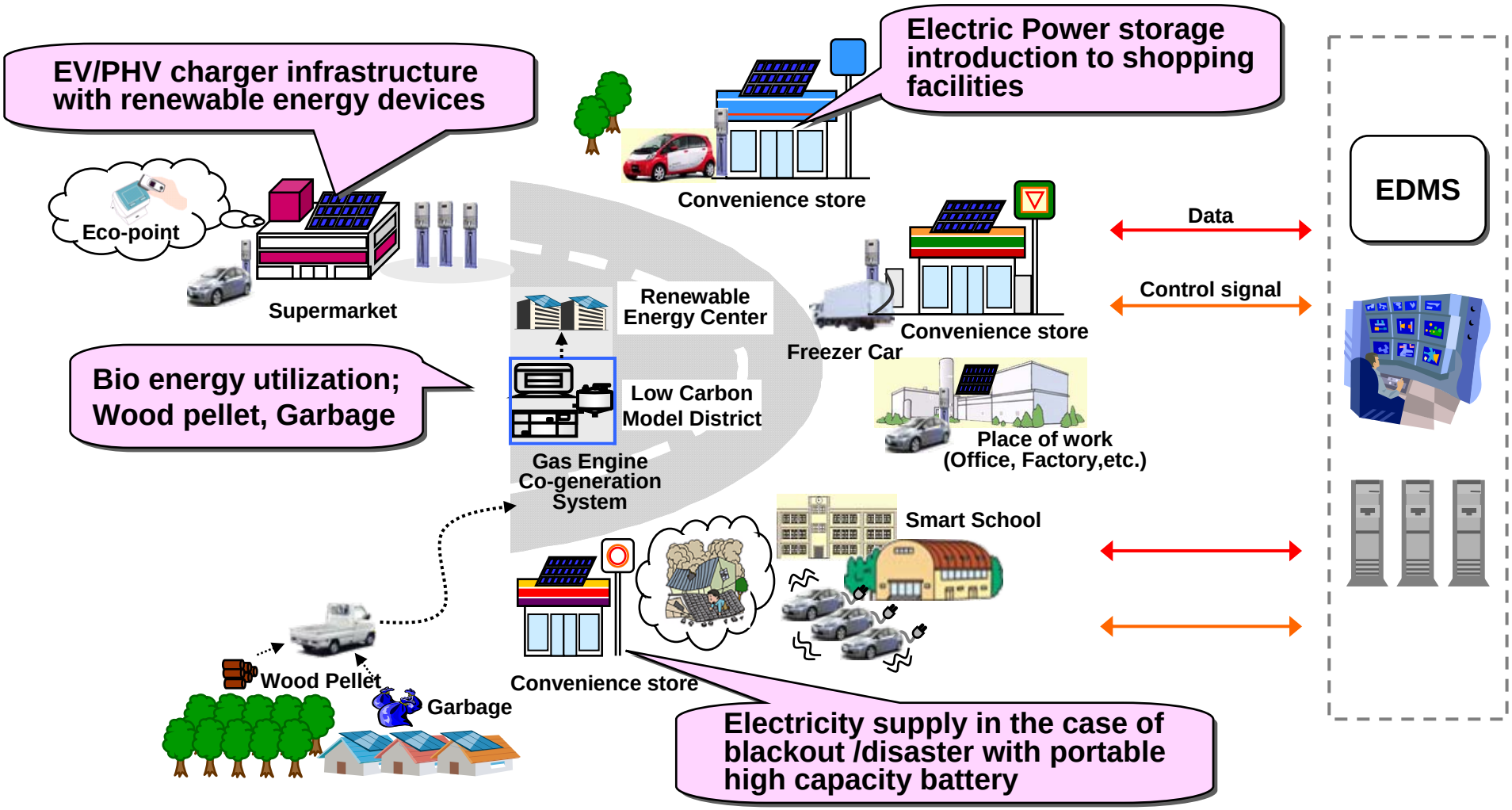
3) OPTIMIZATION OF ENERGY USE IN PUBLIC SPACE



City-wide energy utilization with PV, heat and other renewable energies

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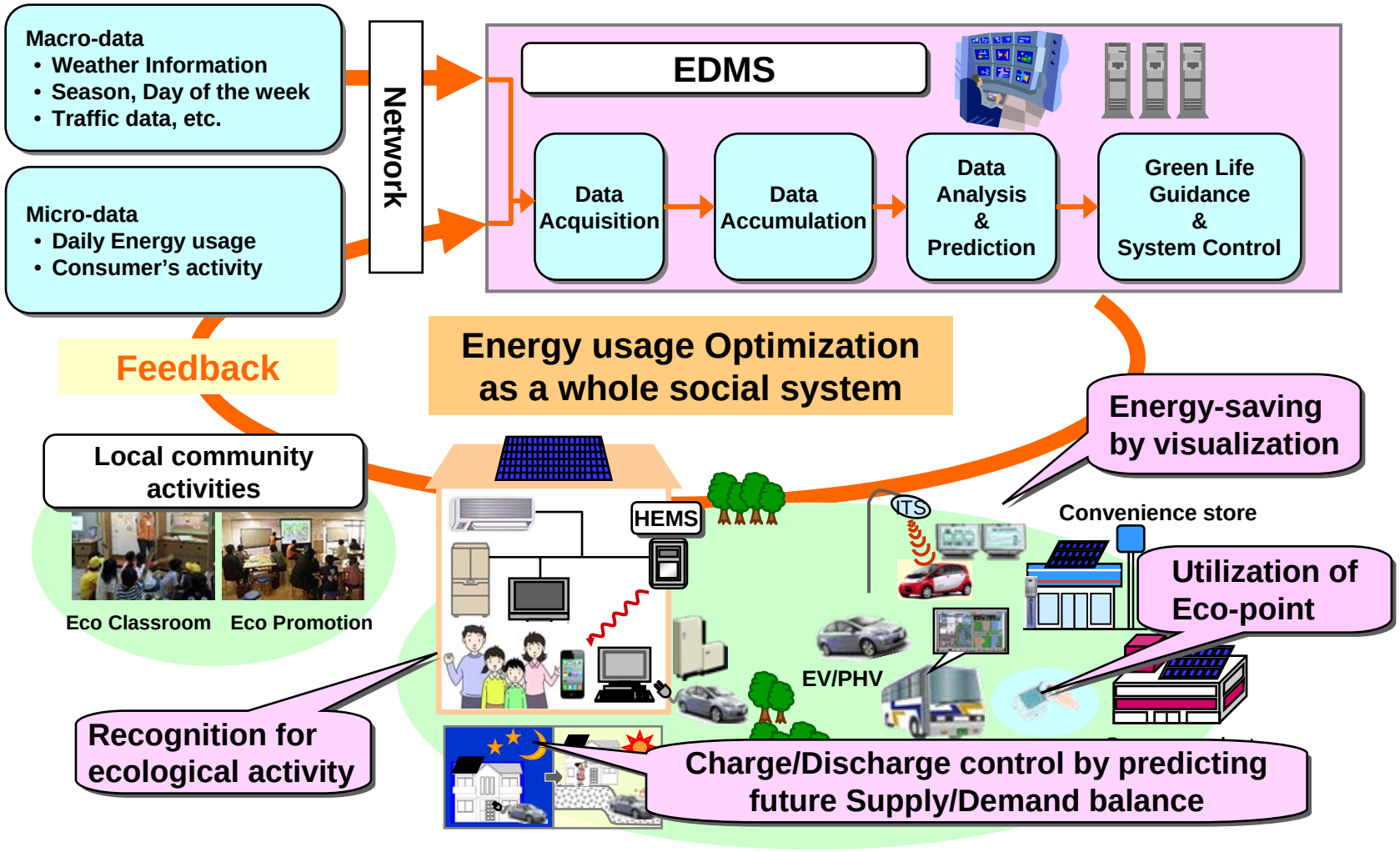
4) MOTIVATE GREEN LIFE STYLE TO OPTIMIZE TOTAL ENERGY USE



Keep the energy of the society in optimum by guiding people to ecological life with high QOL (=quality of life)

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BASIC ALGORITHM OF GUIDING PEOPLE TO ECOLOGICAL LIFE STYLE

"Prediction and information" of energy status in near future is one of the most important things for leading people to "Eco"

Prediction

Macro-prediction

(External condition)

- Seasonal factors, Weekly/Daily factors, Time factors
- Weather, Temperature, Humidity, position of the clouds, etc.
- Energy (Electricity) price (Dynamic pricing)
- Traffic jam info., Event info. , etc.

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Equipments & Services

Micro-prediction

(People's behavior)

- Flow of people's life
- Usage (volume and pattern) of home appliances and PV
- EV/PHV usage, mileage/driving pattern, etc.
- Frequency and tendency of charge, etc.
- Time length and frequency of travel

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Incentives

Effective catalysts for guiding people to greener behaviors

Monetary

- Dynamic pricing
- Eco-point

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Non-monetary

- Visualization
- Education
- Morality
- Competition
- Recognition

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"Change" of behaviors

These will lead to greener behavior of consumers

- Home energy supply/demand status
  - Self-sustaining energy use by PV, etc.
- Eco driving
- Eco mind

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Modify the "Model & Algorithm"

Modify the "Model & Algorithm"

Feedback

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BUSINESS MODEL: TOTAL SYSTEM BUSINESS IS REQUIRED

Paradigm shift from individual product to social system

Class of industry

- Individual product
- Infrastructure and Service System
- Social System

Example: Components of next generation energy system

Car manufacturers
- LIB for vehicle
- EV/PHV/HV
- VtoG System
- Resale value evaluation service

Battery makers
- LIB（home/community use）

PV makers
- PV cell and system

Venture Co.
- Charge infrastructure
- Data Integration System
- Recycle service

Electric Power Co.
- Supply/Demand prediction system
- Energy control system

Heavy Industry
- Weather forecast system
- Energy Data Center

SIer
- Smart meter
- Energy usage control equipment

Competitiveness of individual product was important
- Ex.) Automotive,House, electric appliances, etc.

Global viewpoint for the social system with heterogeneous collaboration is required

Identifying the value-added structure within the social system package is important

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FIELD TEST PREPARATION HAS ALREADY STARTED

Development of the field test area
(actual residential houses for sale)

Developing several systems & devices for the field test

Predetermined "Model town" space for the showcase of Low carbon society

Fuel Cell Hybrid Bus has now in service from Oct.1 2010.

Charging station for PHV/EV (11 stations (21 equipments) are already in service)

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CONTACT INFORMATION

We are interested in interacting with governments (national/local) and companies in the world, who empathize our vision of "human centric smart communities", and collaborating to realize the high-quality and sustainable life of people.

So please contact us if you were interested in our vision and efforts.

TOYOTA

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